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VIEWS, NEWS AND INTERVIEWS.

"In the old days of overhead electric lighting wires, we used to have a great deal of trouble with the tree question, especially along suburban roads," remarked a central station man. "I remember one case where it was imperative that our line run down one side of a street heavily planted with fine shade trees. It was in a swell residence locality, and all the property owners in that vicinity were very particular about their lawns and especially their trees. We wanted to run our pole line as much concealed as possible, and found it absolutely necessary to trim a number of the trees. We sent a man down to visit the property owners, and found that they unanimously declined to allow us to touch the trees. Then we started on a new tack and tried to buy the trees, but not a single man would sell one. Our manager finally hit upon a scheme which proved to be a winner. He inquired around until he found a professional tree trimmer. This man was equipped with a horse and wagon, ladders, and cutters of various sorts. Our manager employed him to tackle the residents of this particular street. The tree trimmer was a man who knew his business thoroughly, and was more persuasive and suave in his arguments than a lightning-rod agent. He started in at one end of the street, and at the end of the week he had persuaded all those obstreperous property-holders that there was just one thing that they lacked in this world, and that was having their trees trimmed. You can rest assured that the way those trees were trimmed provided us with a clear path for our line, and the funny part of it was that the residents, who might have made some money out of us, actually paid money to the tree trimmer for cutting our path through their trees."

"Speaking of trees," said another electric light man who overheard this conversation, "reminds me of an experience we had in our little town one time. A crusty old millionaire owned what was probably the finest tree in town. It was a great, big spreading oak and was probably more than 100 years old. We had to run our line down the side of the street on which this tree grew, and went to see him about cutting a path for the wires through the branches. He of course refused. Then we offered him $500 for the tree, but he would not sell. Finally, one of my linemen, without informing me of what he was about to do, went down to the station and made a copper nail about eight inches long out of some heavy wire. He filed a point on the wire and hammered up a head. Then one dark night, during a storm, he trotted up to the millionaire's place and drove the nail in the tree near the ground, carefully hiding the head with a piece of bark fastened on top of it with a small tack. In about a week the leaves of the tree began to turn yellow and the tree had every appearance of dying. Then the old millionaire came down and offered to sell us the tree at our price of $500. We declined to buy it as we thought it was going to die. Then the lineman came to me and told me what he had done. As the damage had occurred, I thought I would await developments. After several calls from the millionaire, the tree in the meantime getting worse and worse in appearance, I finally bought it for $50. Then the lineman went around and pulled out the copper nail. We got our path through the branches and the tree came back to life. This was to me a new way to kill a tree, but the lineman assured me that it would work every time. He said the copper coming in contact with the sap poisoned the tree. Anyway, we got our right of way through that big oak at a very low price."

Capt. John Bigelow, Jr., of the Tenth Cavalry, reported as wounded at Santiago, completed recently a four years' term of duty as commandant of cadets and instructor in military science at the Massachusetts Institute of Technology, Boston, and received the unusual honor of a unanimous request by the faculty for his return for another detail. He is a son of the Hon. John Bigelow, of New York, Minister to France under Lincoln, and a brother of Poultney Bigelow, the author.

Lieut. S. Dana Greene, United States Navy, one of the officers of the "Yankee," is one of the most popular officers with the New York Naval Reserves. Lieutenant Greene appreciates the boys under him, all of whom are intelligent and alert men and, while exacting strict discipline is always courteous and kind.

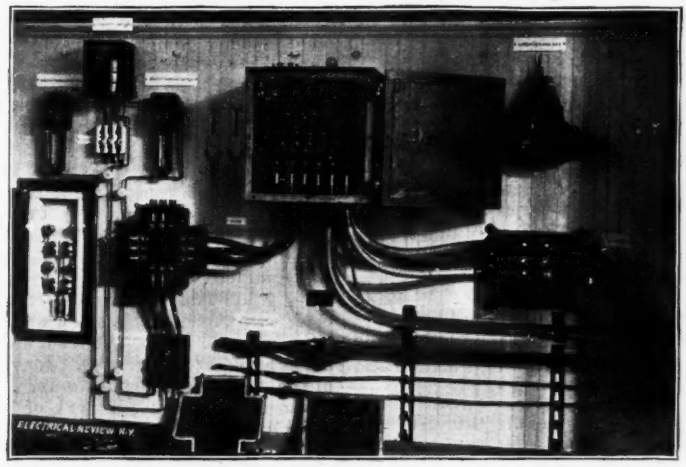

EXHIBIT OF THE CHICAGO EDISON COMPANY AT THE TRANS-MISSISSIPPI AND INTERNATIONAL EXPOSITION, OMAHA, SHOWING SYSTEM OF UNDERGROUND SERVICE AND HOUSE WIRING.

Exhibit of the Chicago Edison Company at the Omaha Exposition.

Perhaps one of the prettiest buildings in Machinery Hall at the Trans-Mississippi and International Exposition, Omaha, is the cottage erected by the Chicago Edison Company for containing its exhibit and to receive the thousand and one interested callers that are attracted by the novel and unique exhibition of what might be called an optical demonstration of the operation and management of a model light and power plant. The thoroughness and systematic manner in which the various details which enter into the operation of such an immense business are presented to the interested spectator can only be appreciated by a personal inspection of the exhibit. Arranged on the south wall of the interior, to the right of the entrance of the structure, is shown a complete system of underground and house wiring for the three-wire direct, polyphase alternating and series arc systems from where the lead-covered cables leave the street to where the current is used in the graceful and artistic incandescent fixture or the more powerful arc lamp.

The east and north walls are covered with four immense frames and several racks with movable frames, showing by means of some 150 photographs and as many more blanks, diagrams, blue-prints, records, tickets and slips, all and everything that the visitor wishes to know. There are views of the several stations operated or controlled by the Chicago Edison Company. There is a beautiful collection of photographs of every employé of the company, from the life-like likeness of President Insull to the interesting group of wiremen, dynamo tenders and helpers of the various departments. Large blue-prints, neatly framed, show the load diagrams of the stations from year to year in a graphical manner. Volt and ammeter records show how accurately the condition of each circuit at any minute of the day is recorded.

In a frame on the north wall one is

attracted by the interesting collection of pictures taken in the Harrison street station, showing arrangement of every piece of machinery and wiring in the building, and in a series of swinging frames to the right of the east wall one is given an idea of the almost perfect system of accounting in use by the company. Every piece of stationery is exhibited from the common dray ticket received by the teamster for a load of cinders to the artistically engraved yellow slip on which the president signs his own name for his year's salary.

ALTERNATING-CURRENT TRANSFORMERS FROM THE STATION MANAGER'S VIEWPOINT.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, OMAHA, NEB., JUNE 30, 1898.

BY W. F. WHITE.

In the early days of alternating central-station development many a sale of alternating central-station equipment was lost to direct-current competitors by the facts, figures and fancies which the salesman of direct-current apparatus was able to advance concerning the wastefulness of energy, the expense of maintenance and the danger to life which purchasers must accept as inseparably wedded to any transformer system.

Notwithstanding that the danger to life was unfortunately made much of, and the facts grossly misrepresented, still the correctness of many of these arguments in the light of present knowledge stand up remarkably well under the scrutiny of qualitative analysis. And it is even more remarkable, in view of the natural tendency to exaggerate, induced by zeal to make sales, how little, if any, were the facts as to these evils overdrawn or magnified. Quantitative analysis in fact proves that most figures then given to show the amount of transformer "leakages" were understated. On the part of the salesman this was undoubtedly more a mistake of the head than of the heart, for, while some few of them knew the results of some isolated tests of some particular size of one type or manufacture of transformer, no one, whether salesman, engineer and designer or manufacturer, had any knowledge or conception of the cumulative effect of transformer losses on the station output. Such little knowledge as had then been acquired related more to the transformer efficiency under certain percentages of rated load than to all-day efficiency, or the 24-hour ratio of energy output to energy absorbed under average conditions.

Little, if anything, was known of transformer core losses, and the effect of power factor on station and line capacities had not had consideration. As long ago as 1892 the writer, in making a careful examination into the operations of one of the then largest alternating stations in this country, made the discovery that with a net meter rate to consumers of about 20 cents per 1,000 watt-hours, the income per kilowatt-hour output at the switchboard was only about six cents, showing an average loss from station switchboard to consumers' meter of about 70 per cent.

Current was supplied in accordance with the then existing universal practice, through one or more transformers for each customer. In two or three cases, for large installations, as many as 18 or 20 transformers were erected for a single customer, no transformer of more than 75 pounds capacity being used; the transformer primaries being connected in multiple, but the secondaries feeding entirely distinct and separate circuits.

Of each 1,000 watt-hours' output at the switchboard it was estimated that approximately 300 watt-hours were delivered through the customers' secondary meters, 600 watt-hours were accounted for by transformer core losses, leaving 100 watt-hours to be accounted for by transmission and other losses.

A statement of these conclusions to a well known manufacturer who had supplied the watt meters and many of the transformers, elicited the opinion that either the primary meters registered too fast or the secondary meters too slow.

A meter expert from the factory accordingly spent several weeks in testing all primary and secondary meters, found them correct and proved that the apparent discrepancy was not due to the meter end of the plant equipment. With the writer's recommendation, that a three-wire secondary network be erected, using 100-volt lamps, and fed through large transformers at frequent centers of distribution, the matter was dropped; but there is no doubt that the proportion of the output attributed to transformer losses was approximately correct.

Since that time it has been the writer's good fortune to be in touch with a considerable number of alternating plants, giving him knowledge of their operating results, and he does not hesitate to assert that very few plants exist giving continuous service, using separate transformers for individual customers, and charging from 12 cents to 20 cents per 1,000 watt-hours, secondary meter measurement, whose income per kilowatt-hour output at the switchboard exceeds from four cents to seven cents. In other words, the ordinary transmission, transforming and distribution losses are commonly as much as 200 per cent of the customers' demands, as shown by the customers' meters. This does not mean operating expenses three times as great as if all these losses were eliminated, but it does mean that large expenditures are made for fuel and feed water for the keeping warm of numerous transformers operating about 20 hours per day with open secondaries. And great numbers of small transformers also mean great variations of secondary voltage, large bills for lamp renewals, unsatisfactory service, and a reduced number of lamps which can be served at any instant from a given generator capacity. To show the benefits to be derived by using a secondary network, fed by large transformers working in multiple, but located one at each feeding point or local center of distribution, as compared with the use of small transformers, one or more to a customer, the writer presents some results accomplished by an existing plant in remodeling its transformer system in accordance with these ideas.

January 1, 1895, this plant was serving 16,702 incandescent lamps (16 candle-power equivalent) through 547 transformers of 22,190 lamps rated capacity, each transformer averaging 40.6 lamps capacity and serving 30.6 lamps. The transformer load, with open secondaries, was, as near as could be determined, about 80 amperes, at 1,000 volts. In view of the fact that the maximum load never exceeded 50 per cent of the lamp capacity connected, it was evident that a very considerable reduction could be made, both in the number of transformers connected and in their aggregate capacity, by the use of a secondary network. The theoretical limit was to reduce the transformer capacity to equal the maximum load, which would lower the capacity connected from 22,190 lamps to about 8,000 lamps, a reduction of about 64 per cent. This limit was evidently impossible of attainment because of the large number of isolated installations, especially in the residence districts, requiring individual transformers which, of necessity, must generally be of capacity equal to several times the average load. A system of three-wire secondary networks was laid out, and estimates made showing a possible reduction of almost 80 per cent in the number and of about 50 per cent in the lamp capacity of transformers connected. A large number of tests of core losses of all sizes of transformers in service was then made for estimating the total core losses for the plant and for comparisons with the estimated core losses of the large transformers to be erected in replacing the old.

An illustration of one or two of these comparisons may be of interest. One installation of approximately 700 lamps was fed through a large bank of small transformers having an aggregate core loss of 4,440 watts, which could be replaced by two transformers having a combined estimated core loss of 310 watts. On the basis of the number of watt-hours per pound of coal then being produced by the plant, not taking into account any line losses, this example shows the following results:

	Watts.	Watt-hours per year.	Require tons coal.
	4,440	38,8 4,400	190.6
	310	2,715,600	8.4
Annual saving.		36,178,800	182.2

The annual income from this installation was about $2,100, at 12 cents per 1,000 watt-hours. With a secondary output of about 17,800,000 watt-hours, and transformer core losses of about 38,894,400 watt-hours, the income per kilowatt-hour output at the switchboard for this installation was very evidently less than $0.04, and the core losses were more than double the total secondary output.

In another case one section of the city, comprising 10 city blocks, was fed by one dynamo and a circuit through 71 transformers, having an aggregate rated capacity of 4,482 lights, and aggregate core losses of 10,402 watts (estimated), or 91,121,520 watt-hours per year.

To replace these transformers a three-wire secondary network was erected, supplying all customers, and fed by five 400-light transformers, located at as many feeding points or local centers of distribution. Each transformer was provided with primary and secondary switches, by means of which each night all transformers were thrown into service from dusk until midnight, at which latter hour four transformers were cut absolutely out of circuit. On a yearly average, five transformers were in circuit about six hours per day, and one transformer the remaining 18 hours per day. The combined core losses of the five were about 1,250 watts, and for the hours in service aggregated about 4,380,000 watt-hours per year. Some results of the above changes on this one circuit therefore were as follows:

Number of transformers.	Lights. Capacity.	Total core losses. Watts.	Total annual core losses. Watt-hours.	Equivalent tons coal.
71	4,482	10,402	91,121,520	446.7
5	2,000	1,250	4 380,000	21.5
Saving....	2,482	9,152	86,741,520	425.2

A reduction of over 95 per cent in core losses, and a saving for one year in cost of fuel alone of $815.40, were effected for this one circuit. These examples were extremes, because the lighting covered by them was concentrated, and because in most residences and outlying business districts few changes in the number and capacity of transformers could be made. The results shown by the last example were therefore much above the average for the whole plant, but serve to show the possibilities of such changes and the methods pursued in this case.

Some results for the plant as a whole may therefore be fairly indicative of what other average plants operating under similar conditions may accomplish in the same direction, and were as follows:

Time.	Lamps connected.	Transformers connected.	Total capacity.	Average lights capacity.	Average lights served.
January 1, 1895.	16,702	547	23,190	40.6	30.6
January 1, 1896.	19,282	201	13,865	69.	90.1
January 1, 1897.	20,262	152	13,498	88.8	133.3
January 1, 1898.	23,643	141	14,946	106.	167.7

Year.	Income.	Switchboard output. Kilowatt hours.	Income per kilowatt hour output.	Increase of income per kilowatt hour output.
1894	$59,012 71	928,400	.0635	.....
1895	54,231 67	791,752	.0684	7.7 per cent.
1896	51,415 29	551,064	.0933	46.9 "
1897	56,317 42	508,070	.1108	74.5 "

Year.	Actual kilowatt hours output.	Estimated kilowatt hours output. Basis, 1894 conditions.	Estimated kilowatt hours saved by change.	Estimated saving in coal. 1894 basis. Tons.	Cost.
1894	928,400	.....	.....	.....	.....
1895	791,752	854,042	63,290	310 2	$670 91
1896	551,064	809,689	258,625	1,267.8	2,641 42
1897	508,070	886,888	378,818	1,856.9	4,015 43

It must be borne in mind that the number of 16-candle-power equivalents connected January 1, 1895, was 16,702, and increased by January 1, 1898, to 23,643, or more than 41.5 per cent. The savings estimated in last table are based on the conditions at the beginning of this period; i. e., the same number of transformers and the same transformer capacity. But if the same conditions had obtained throughout, an increase of 41.5 per cent, or 227 transformers of 9,208 lights capacity, would have been added to supply the new lights connected. And while only a part of the core losses of the transformers in service January 1, 1895, was saved by the change, the entire losses of the 227 transformers which would have been required by increased business were saved. It is, therefore, perfectly safe to add 50 per cent to the savings shown in the last table in estimating actual benefits. From reduced core losses alone, therefore, an annual saving of approximately $6,000 is being enjoyed.

In core losses alone the savings already effected have more than paid all costs of the entire change of lamps, meters and transformers—for, because of a simultaneous change from 52 volts to 106 volts, secondary, all lamps and meters also had to be changed—and of the erection of secondary networks; and the annual saving of $6,000 is equal to six per cent interest on $100,000, secured without $1 invested.

To be certain that the saving of fuel was in proportion to the reduction in kilowatt-hours output, as estimated, the plant efficiency under the changed conditions must be known. It is, therefore, pleasing to note that, using coal from the same mine most of the time, the watt-hours output per pound of coal actually increased for 1896 by 3.8 per cent, and for 1897 by 5.9 per cent over 1895, so that the saving in fuel was at least not less than in proportion to the saving in kilowatt-hours output.

Some incidental advantages of the change may be mentioned.

1. Under the old plan, the 6,941 lights added would have required about 9,200 lights, additional transformer capacity, of 40 lights average size of $1 per light average cost, giving an investment saving of $9,200.

2. The transformer load with open secondaries of 80 amperes was reduced by the Fall of 1897 to about 30 amperes, notwithstanding an increase of about 25 per cent in the number of lights connected. A saving of 50 amperes at 1,000 volts represents a capacity to serve, without additional station or line equipment, approximately 1,000 16-candle-power equivalents, all burning at one time, or fully 2,000 16-candle-power equivalents connected.

3. Formerly as many as a dozen transformers were frequently burned out in a single "thunder" storm. Ten per cent of the transformers connected would be a conservative estimate of the number burned out each year from various causes. Of the new transformers connected during the past three years only one has failed from any cause; that one was defective, and burned out under light load almost immediately upon being put in service. Transformer repair costs are therefore practically eliminated.

4. Incandescent lamp renewals have been greatly reduced. Using lamps from the same factory, of the same efficiency, and bought at the same price per lamp, the cost (estimated) of renewals per kilowatt-hour consumed by the lamps has been reduced from $0.0081 in 1895 to $0.0057 in 1897, a reduction of 29.6 per cent. This saving represents the advantage of regulating the secondary voltage by pressure wires connected to the secondary network, as compared with the former method of regulating the primary voltage by station transformers.

5. The principal remaining incidental advantage is the uniformity of voltage, bringing uniformity in quality of service and consequent satisfaction of customers, the value of which can not be estimated in dollars or percentages. These are some actual results and such as any plant operating under similar conditions can achieve at small expense, if the changes are well planned, and the replaced apparatus sold to the best advantage.

In this connection, attention must be called to one other fact, which is, that central stations using separate transformers for individual customers have the great majority of their transformers working on open secondaries, probably 80 per cent of the time. The best transformers have a power factor of about 50 with open secondaries, and of fully 99.9 with almost any lead they carry in practice. It is therefore perfectly credible, and the writer has demonstrated it to be so by many actual tests on various plants, that the average power factor of plants operating under above specified conditions is approximately 65.

It scarcely needs demonstration that, if instead a secondary network is used, and only such transformers allowed to remain in circuit at periods of light load as are required to advantageously carry such load, the average power factor will be approximately 100. The volt-ampere hours therefore, calculated from the station voltmeter and ammeter readings, give approximately the watt-hours output. But almost all existing plants use separate transformers for individual customers, and the great majority of them do not have primary wattmeters on their switchboards, and do calculate their volt-amperes-hours output as equivalent to watt-hours, getting results about 50 per cent in excess of the facts. They therefore are able, apparently, to show 50 per cent more watt-hours per pound of coal, and 33⅓ per cent less expense per kilowatt-hour output than another station operating under the same conditions and fully equaling theirs in actual performance, but which accepts the primary meter readings as the basis of estimate.

As a matter of fact the usual disparagement is greater than the percentages given, because most station managers in erecting primary switchboard meters follow their æsthetic inclinations and use ornamental glass covers, which are particularly susceptible to the admission of dust and grit, with the result that the meters rapidly slow down. It is highly probable, therefore, that in some sections the volt-amperes-hour record would show twice the number of apparent watt-hours per pound of coal, and one-half the expense per apparent kilowatt-hour output that would be shown by the record of the primary meter already erected on the switchboard, which tends only to show the worthlessness of the data from different plants for purposes of comparison, unless the local conditions are known in each case.

This digression is permissible, we hope, because the average power factor, so far as we know, has never been taken into account, and because for that reason much misleading alternating central-station data is in circulation.

Purchasers and users of transformers should insist that transformers meet certain requirements or be rejected, and some of these requirements will be stated.

Where transformers are used for feeding networks, the secondaries in multiple, small core losses are of much greater importance than close regulation and should be kept at the lowest practicable point. The regulation will be cared for by treating the transformer and feeder-drop together through the use of secondary pressure wires.

Where the transformers are entirely independent, feeding separate secondaries, close regulation must be had and the core losses be made as slow as the adopted regulation will permit. With constant full load the temperature must not rise to a high point and should not exceed 50 degrees centigrade above the surrounding air. This is important, not only because of the increased life of transformer insulation through low temperatures, but also, and possibly to a greater degree, because magnetic fatigue is a certain follower of high-core temperatures. If, therefore, the core losses might be increased 50 per cent or possibly 100 per cent through high temperatures, the cost of these core losses, as shown in the case of the plant above, make argument unnecessary as to the desirability of having transformers run cool.

The transformer case should be filled with oil, because of its insulating qualities and its exclusion of air, and because of its assistance in maintaining the lower temperature desired.

The insulation resistance between the primary and secondary windings should be able to stand up under not less than 10,000 volts, alternating difference of potential, for transformers having 1,000 volt or 2,000-volt primaries, and the writer would strongly urge a 15,000-volt alternating test. If both the primary and secondary windings are on the core, the same insulation resistance should be required between either winding and the core as between the two windings. The use of grounded shields placed between the primary and the secondary windings, the grounding of the shield or core, the grounding of the secondaries, the placing each customer's service connections of any device to automatically open the circuit of such customer in case of an unusual difference of potential, are all practices that are opposed as expensive, as liable to cause, more than to prevent, trouble, as complicating existing practice and as wholly unnecessary.

Proper insulation is sufficient protection against the damages sought to be avoided. Station managers as earnestly desire complete safety for life and property as the Underwriters Association, but vigorously oppose the introduction of any unnecessary devices that are expensive to install and to maintain. That association, in seeking protection for the secondaries, should do so through sufficient transformer insulation and low temperatures. Both of these requirements mean increased cost of production and higher selling prices, but as the consequent increased economy makes the increased cost a profitable investment, no reasonable manager will object. In this way the ends sought will be best attained and the interests of all parties duly safeguarded.

The Class of Readers Counts.

Has it ever occurred to you that the kind of circulation is of some importance? Is a circulation gotten by the forcing process, by sledge-hammer solicitation, by all sorts of subterfuges, premium schemes and gift enterprises worth as much as a circulation founded on the intrinsic merits of the reading matter of the publication—a circulation that has grown of itself?—*H. J. B., in Advertising Experience.*

About Foreign Electrical Trusts.

The Creditanstalt, of Vienna (Austria), in company with the Hungarian Credit Bank, the Discount Company in Berlin, the Banca Commerciale in Milan and the great machine factory company, Ganz & Company, is organizing an electric trust for Italy. The capital of 2,000,000 lire is small for the beginning, but it is to be raised by degrees to 30,000,000 lire. A number of contracts have been already secured, and it is expected that specially good results in course of time will be the consequence. In Austria there is not the same activity in electrical enterprise as in Germany. Perhaps the introduction of the Nerust and Welsbach patents will cause a change in this department. The Nerust patent has been acquired for Hungary and Italy by Ganz & Company, at Budapest, and in this company the Hungarian Credit Bank and, indirectly, the Creditanstalt participate.

GENEVA, June 18. — The great Swiss Electrical Trust, projected already for some time past, has now been called into life, with a capital of £1,000,000, £600,000 of which has been taken over by the Banque de Paris et des Pays Bas, and the remainder by the Union Financière.

The objects of the new venture would seem to be sufficiently indicated by its title; but it should, perphaps, be added that not only Switzerland, but France, will be included in the field of its operations. In order to preserve its Swiss character the offices are to be here; but they will be conveniently near to France.

An Interesting Experiment.

Mr. Henry N. Warren, writing in the *Chemical News*, Vol. LXXVI, page 200, claims "the production of electrical energy by the direct action of the atmosphere." The experiment by means of which he demonstrates this, says our London namesake, may be described as follows: Plates are prepared of a special porous compressed graphite, and about one-fourth of each plate is rendered active by immersion in platinic oxalate, drying and igniting in an atmosphere of hydrogen. In contact with a solution of ferrous sulphate, the platinum surface induces oxidation of the iron by the oxygen of the atmosphere. Several of these plates are attached to a circular lead beam, which surrounds a porous diaphragm containing as negative element a rod of amalgamated zinc, the carbons being so arranged as to allow the platinized portion to project above the solution, which consists of strongly acidified ferric sulphate. On completion of the circuit a powerful current is at once generated, and continues until the complete reduction of the ferric salt has taken place, which naturally terminates the action. On now withdrawing the zinc, the platinum surface condensing the atmospheric oxygen steadily re-oxidizes the ferrous salt, and thus renews the action when required.

ELECTRIC LIGHT FLASHES.

The Potomac Electric Power Company, of Washington, D. C., has increased its capital stock to $1,000,000.

James D. Feeter, president of the Little Falls, N. Y., National Bank, has been appointed, by Judge Scripture, receiver of the Dolgeville Electric Light and Power Company.

The stockholders of the Wilkesbarre, Pa., Electric Light Company have decided to borrow $50,000 to defray the cost of building the sub-plant on North Washington street. The company is going to considerable expense to improve its plant and furnish first-class service.

At the annual meeting of the Woodstock, Vt., Electric Light Company the following directors were elected: Aubrey Hilliard, Norman Marshall, Boston; A. M. Mills, W. S. Hewitt, F. S. Billings. Aubrey Hilliard was elected president, and F. S. Billings, treasurer.

The Southern California Power Company has let contracts to two electric companies for installing machinery in the new plants to cost $100,000. This large outlay is to provide machinery at the powerhouse in the Santa Ana Canyon, and at the distributing points at Los Angeles and Pasadena.

The Edison Electric Light Company of Detroit, Mich., will soon begin an extensive remodeling and improvement of its plant at the corner of Washington avenue and State street, involving an outlay of $20,000. R. E. Raseman is at work on the plans, and operations are expected to be begun within a few days. Two stories will be added to the present building, and the latest devices employed to make the plant completely fireproof and up to date in every respect.

Death of Dr. Cornelius Herz.

Dr. Cornelius Herz, who has been a fugitive from France for five years on account of his alleged connection with the Panama Canal scandals, died on July 6, at Bournemouth, England.

Dr. Herz was born at Besançon, France, about 52 years ago, of German parentage. He was brought to America at the age of three years. He studied medicine and practiced as a physician in New York city. Later he went to California, where he became interested in electrical matters. On the advent of the telephone, he

DR. CORNELIUS HERZ.

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was instrumental in introducing it into France, and thereby acquired a considerable fortune.

He was prominent in organizing the Paris Electrical Exposition of 1880, which was instrumental in bringing forward a number of electrical inventions and of discovering several inventors now widely known. Dr. Herz's principal connection with the electrical field was the founding of the electrical journal *La Lumière Electrique*, of Paris, which, while it was published, was one of the ablest of the foreign electrical periodicals.

After an unusually successful and brilliant career in scientific and financial circles, Dr. Herz's troubles began with his arrest at Bournemouth, England, on January 19, 1893, under extradition proceedings on a warrant from the French Government, charging him with fraud and embezzlement growing out of the Panama Canal scandal. Dr. Herz was ill at the time and confined to his bed. He was arrested, however, and remained under arrest for four years, as under the British law a prisoner wanted for extradition must appear at the Bow street police court. Then a special act was passed, the magistrate took Herz's testimony at his bedside, and the charges were dismissed. In 1894, two years before these charges were settled, Dr. Herz was sentenced to five years' imprisonment and to pay a fine of $3,000. He subsequently demanded that the United States State Department should prefer a claim for $5,000,000 damages against the French Government because of the confiscation of his property in France.

The ELECTRICAL REVIEW presents herewith a portrait of Dr. Herz, which appeared in these columns in 1892. This was the first portrait of Dr. Herz which ever appeared in America, and the others that have appeared since have been sketched or reproduced from this one.

ELECTRIC RAILWAY NOTES.

The St. Louis and Belleville Electric Railway, East St. Louis, Ill., has certified to an increase in capital stock from $50,000 to $500,000.

A trust mortgage for $2,000,000 has been filed in Brooklyn, N. Y., by the Coney Island & Brooklyn Railroad Company to the Mercantile Trust Company on property at Smith and Huntington streets and Coney Island avenue and King's Highway, and upon the franchises of the company, to secure an issue of four per cent bonds made necessary by the consolidation agreement with the Brooklyn City & Newtown Railroad Company.

Frederick Uhlman, president of the Brooklyn, N. Y., Elevated Railroad, announced last week that the Fifth avenue line of that road will be equipped and run by electricity early next Fall. The new Rockaway Beach line is expected to be opened by July 15, and it is believed that the connections with the Long Island Railroad will be completed before Winter, and that trains from Jamaica and points beyond will be run across the Bridge by the beginning of the new year.

The directors of the Metropolitan Street Railway Company, of New York city, have decided to make the increase in the capital stock of the company, which has been so long expected, by the issue of $10,000,000 additional stock, which will be offered to the present stockholders at par. This will be an increase of 33⅓ per cent, and will bring the capital stock up to $40,000,000. Of the proceeds of the new stock $6,000,000 will be used in the retirement of outstanding debentures and the balance will be expended in the change of motive power on the Sixth and Eighth avenue lines by the substitution of the underground trolley for horses.

A Unique Machine Shop.

In the designing and building of modern manufacturing plants, one of the most important questions to be considered is the lighting of the interior of the building. Manufacturing plants at the present time are located, generally speaking, in large cities, or at least in regions where the population is somewhat dense, so that a great deal of loss is experienced by the owners on account of the help watching people passing by or by occurrences taking place in the adjoining streets. On the other hand, the importance of thoroughly lighting the interior of a shop is so great that this fact takes precedence over all others. Why not combine the two? Why not have a well lighted interior, and at the same time have the sides of the building so constructed that the employés are unable to have their attention attracted by what is taking place in the surrounding streets? The accompanying illustrations show a machine shop designed and built by the Berlin Iron Bridge Company, of East Berlin, Ct., for the Veeder Manufacturing Company, of Hartford Ct. The Veeder Manufacturing Company are noted for the excellence of the Veeder cyclometer, which is one of the best instruments for recording distances traversed by bicycles there is made in the country. The mechanism of these cyclometers is very fine, and in the different processes of manufacture it requires the best of light in carrying on the various operations. The business of the Veeder Manufacturing Company being largely on the increase, they decided to build an entirely new plant, and the illustrations herewith show their new machine shop both externally and internally.

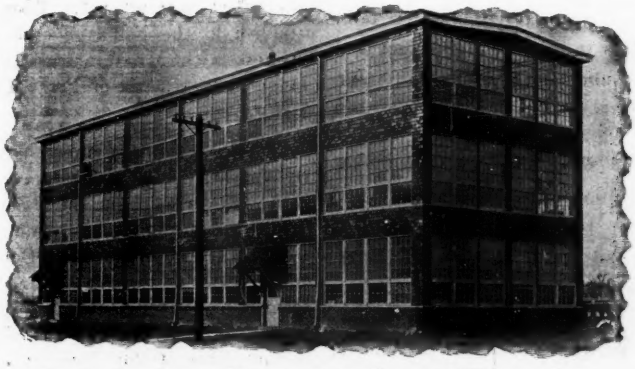

FIG. 1.—THE VEEDER MANUFACTURING COMPANY'S MACHINE SHOP.

The first illustration shows the exterior of the building, which is of a somewhat novel construction. The supporting framework is entirely of steel, the greater portion of the construction being steel and glass. It is three stories in height, the exterior presenting a very ornamental appearance from the unique character of the construction. It is 30 feet in width, 110 feet in length, the three floors giving nearly 10,000 square feet of floor surface, every inch of which, owing to the well diffused light in the interior of the building, can be occupied with manufacturing purposes.

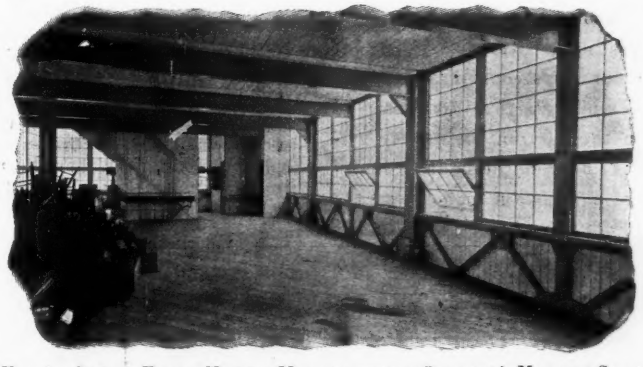

FIG. 2.—SECOND FLOOR, VEEDER MANUFACTURING COMPANY'S MACHINE SHOP.

Fig. 2 shows the interior of this building, the photograph from which this illustration was made being taken in the second floor, showing the supporting girders of the third floor above and the truss work forming the supporting girders for the sides of the building. The interior is heated by hot air forced into the interior of the building from an adjoining boiler-room by means of ducts located and made a part of the supporting columns of the building. This peculiar feature of the building was designed by C. H. Veeder, the president of the company, and adopted by the Berlin Iron Bridge Company in their design.

Particular notice is called to the sides of the building, which are made almost entirely of glass, but arranged in sections so that they can be easily opened and closed, thus securing plenty of fresh air. A great many people have an idea if the sides of a building are made of glass that the interior in warm weather will be insufferably hot, the same as a green house. The facts of the case are exactly opposite. Owing to the superior ventilation secured by means of every other panel of the glass swinging on a center pivot, perfect ventilation may be secured, and thus, instead of being exceedingly hot in warm weather, it is extraordinarily cool, and pure, clean air from the outside is furnished for the workmen.

Fig. 3 is also taken from a photograph and shows the interior of the upper floor of the building. This floor is entirely clear of columns, the roof trusses being of sufficient capacity to support not only the roof loads, but also to carry shafting, pulleys, hangers, etc. Particular attention is again called to the lighting of the interior of this portion of the building. A large amount of glass admits and diffuses the light so thoroughly in and through the interior of the building that the very fine work of the Veeder cyclometers can be carried on in the center of the building as well as on the outside. The building is a credit to the designers, the Berlin Iron Bridge Company.

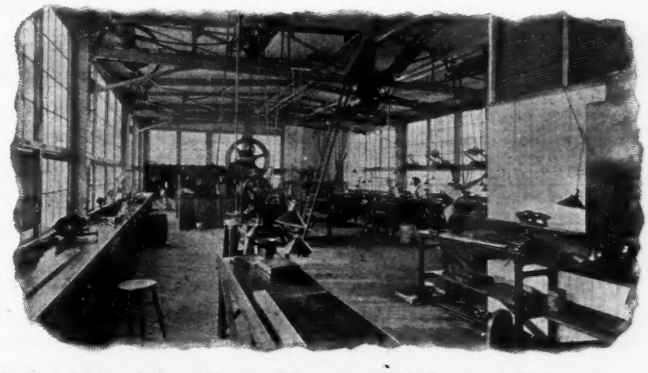

FIG. 3.—THIRD FLOOR, VEEDER MANUFACTURING COMPANY'S MACHINE SHOP.

The current both for power and lighting in the shop of the Veeder Manufacturing Company is obtained from the local electric light and power company at the pressure of 220 volts and in two phases. The 110-volt lamps are distributed by the ordinary three-wire system, the numbers on each phase being about equal.

Power is derived from General Electric two-phased induction motors. A five-horse-power specially wound motor is used to run the elevator, the motor being directly belted to the hoisting mechanism and reversed by a special switch. In order to avoid excessive currents in the armature winding when starting, the end connections in the armature winding are made of high-resistance metal. Some trouble was found at first on account of the excessive momentum of the armature, but a flange pulley was placed on the armature shaft and the belt allowed to run sufficiently loose so that the belt can slip on the armature pulley when the hoisting mechanism is stopped quickly. This arrangement has been in use several months and gives no trouble.

The tool room and machine shop are driven by a five-horse-power motor with standard winding, and the finishing room is driven by a three-horse-power motor. The motors have proved to be very satisfactory, running steadily and requiring very little care.

A Monster Generator.

The Walker Company, of Cleveland, Ohio, recently received from the Boston Elevated Railroad Company an order for what is said to be the largest direct-current generator ever built. It will have a rated capacity of 4,000 horse-power, which can be stretched to 5,000 for short emergency runs.

This machine will weigh over 300,000 pounds, the armature alone weighing over 100,000 pounds. The outside diameter of the field magnet will be about 24 feet. The field will contain 24 or 26 magnet poles.

So massive will the armature be that it will be impossible to ship the armature after it is wound, and it will be necessary to do this part of the work in the power-house at Boston. To construct this generator will require five or six months. It will be direct-connected to a 5,000-horse-power steam engine, forming one of the largest direct-current generating units in the world.

Electrical Review

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Two battalions of the Volunteer Engineers have been mustered into the government service at Camp Townsend, Peekskill, N. Y., the second battalion being in command of Major Louis Duncan. The officers are now attending a school of instruction and the men are being regularly drilled. It is rumored that these two battalions, and perhaps a third, will soon be called on for active service, probably in the Porto Rican campaign.

England is having her telephone troubles. The business in that country is divided between the National Telephone Company, which is said to control all the profitable undertakings, and the British Post Office, which operates what is left of the system. Now they are endeavoring to get a bill passed giving municipalities the right to construct and operate telephone systems. Hence there is a very pretty triangular fight, with the result still in the dim distance.

The importance of the electric searchlight in modern warfare can not be overestimated. Thus far, in our war against the Spanish, the searchlight has proved its value in warding off torpedo boat attacks, in illuminating a mark on shore at which our ships could fire at night, and in sending signals from ship to ship in the fleet on the wigwag system. Aside from the fighting equipment of the modern man-of-war, the searchlight is probably the most important piece of apparatus in use by our navy.

On another page of this issue of the ELECTRICAL REVIEW we publish a paper by Mr. W. F. White, entitled "Alternating-Current Transformers from the Station Manager's Viewpoint," read before the recent Omaha meeting of the American Institute of Electrical Engineers. It is said that this is probably the first paper ever read on actual commercial tests of transformers. We are informed that the conclusions here reached are the result of over two years' hard work. Mr. White's paper will without doubt appeal to all central station managers.

In spite of the war tax on telephone messages, at least two of the largest Bell licensee companies have reduced their rates. The New York Telephone Company has established a price of 10 cents for each message within one borough of New York city, as against the former rate of 15 cents. The New England Telephone and Telegraph Company, which operates in Boston and the surrounding territory, has lowered its rate from 15 cents for five minutes' talk to 25 cents for 10 minutes' talk. And this in the face of the fact that the telephone companies will stand the war tax.

LITERATURE ON THE CAR BARN.

Cincinnati, the metropolis of Ohio, has long been noted for its conservatism and other practical attributes. If a man in any walk of life out there shows his fitness for a better job, he is promptly advanced on his merits, and no questions are asked as long as he performs his duties satisfactorily to his employers. This may explain how it comes about that such notices as the followir g appear on the bulletin boards at the car barns of the Consolidated Street Railway Company:

"Notice to Conductors—Any one Regular, Triper or Sub, that has Dirty Windows will get a week."

"Notice to Motormen—Any one Running them 58 Motors will feed them slow if you Feed them Fast you will blow up the Contuler and you will have to stand the result."

It is evident that the foreman who wrote these notices is not a grammarian. But was he employed as a master of literary style or as a practical street railway man? The notices are almost unintelligible to the layman, but it is certain that the men for whom they were written understand them—which is the main and only object aimed at. A large corporation should always endeavor to improve the condition of its employés—morally, mentally and physically. While President Kilgour, who is an eminently practical man himself, is undoubtedly chiefly concerned with the successful operation of his road, we think it would do no harm if he established a sort of censorship over his foremen's bulletins. The example of correctly prepared notices, which are supposed to be read by all conductors and motormen, would undoubtedly be reflected in their written reports to the company and would stand them in good stead when they come up for promotion.

PERSONAL.

Mr. Arthur Perry, vice-president and general manager, and Mr. Allston Burr, treasurer, of the United Electric Securities Company, Boston, have resigned their respective positions, to take effect September 1. They will establish in the Fall a general bond business with Mr. Winthrop Coffin, under the firm name of Perry, Coffin & Burr.

Passed assistant engineer William D. Weaver, United States Navy, has been transferred from the "Scipio" to the supply ship "Delmonico," which will be attached to Commodore Watson's eastern squadron, formed to pursue Camara's fleet and harass the Spanish coast. Mr. Weaver is the editor of the *American Electrician*, and is widely known in the electrical field.

Mr. Wm. S. Brayton, of the New York office of the General Electric Company, was married on May 3 last to Miss Alice Wait, of Ithaca. Mr. Brayton is a graduate of Cornell and passed through the works at Schenectady before assuming his duties at the New York office. He is a favorite among all his associates, who testified their appreciation by presenting him with a handsome souvenir of their esteem. The ELECTRICAL REVIEW extends its congratulations to the happy couple.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The market during the week was somewhat irregular and only moderately active. Toward the close of the week there was a general improvement in prices, the advance being made on prospects and rumors of peace, the adjournment of Congress, and especially on the evidences of an advance in the Vanderbilt stocks. General Electric closed on Saturday at 40, a gain of one point over the closing price on July 1. The highest point reached during the week was 40½. Western Union closed at 93¼, showing a small fractional loss as compared with the previous week. On the Boston exchange American Bell closed at 274 bid and 274½ asked. General Electric preferred was held at 95 bid. Erie Telephone Company closed at 68¼ bid and 69 asked. The Brooklyn City Railroad Company has declared a quarterly dividend of 2½ per cent, payable July 15. On the Philadelphia exchange Electric Storage Battery common closed at 29½ bid, 29¾ asked.

Wall Street, July 9.

The Annual Convention of the Canadian Electrical Association.

The eighth annual convention of the Canadian Electrical Association was held at the Windsor Hotel, Montreal, on June 28, 29 and 30. The attendance of delegates was satisfactorily large. At the first session on June 28, Mayor Prefontaine welcomed the visitors to the city. President John Yule then read his annual address, in which he reviewed the electrical developments in Canada since the last meeting of the association in Montreal, which occurred four years ago. Mr. J. J. Wright, of the committee on meters, reported that no special business had been brought before the committee during the year and therefore it had not met. Messrs. Reesor, Smith and Hunt were appointed by the president as a committee to convene standing committees. A paper, entitled "How to Overcome Some of the Difficulties Encountered by Central Station Men," was read by Mr. Wright, treating the subject from the point of view of the central station man doing business in a town of moderate size. The paper was discussed by Messrs. Reesor, Dion and Ellis. The session then adjourned until 2 P. M. Mr. L. D. Magie opened the afternoon meeting by reading a paper, entitled "Electrical Utilization of Water Powers." The question of postponing the discussion of this paper until the next annual meeting was debated at considerable length. It was decided finally to go on with the discussion, which was participated in by several members. Mr. W. F. Bonner followed with a paper on "The Unconscious Ownership of an Important Key," in which he developed the opinion that managers of suburban street railways, by not canvassing the farmer population, lost sight of a field of steady utilization of their power. He cited a practical example, where a suburban road supplied power to fruit growers and farmers, each of whom had a small but certain amount of current in use almost constantly during the day.

The members of the association and their friends visited the following points of interest on Wednesday afternoon: Canadian Bell Telephone Company's plant, Montreal Street Railway Company's power-house, and the Lachine Rapids Hydraulic and Land Company's works, where luncheon was served.

The election of officers for the ensuing year took place at the morning session on June 30. The result was as follows: President, William H. Browne; first vice-president, H. P. Dwight; second vice-president, A. A. Dion; secretary and treasurer, C. H. Mortimer. On the adjournment of the session a visit was paid to McGill University and the plant of the Royal Electric Company. A special train conveyed about 200 of the members and their friends to the power-house of the Chambly Manufacturing Company at Richelieu, where the hydraulic development at that point was inspected and a luncheon was enjoyed.

About 100 persons attended the annual banquet, which was held at the Windsor Hotel on June 29. Toasts were responded to by Mayor Prefontaine and Mr. Browne, the newly elected president.

Conductivity of Electrolytic Copper.

The great improvements made in the electrolytic refining of copper and the purity of the metal which is now furnished commercially is shown by the fact that recent market circulars of Messrs. James Lewis & Son, of Liverpool, give quotations for "wirebars, with 100 per cent conductivity guaranteed," says the *Engineering and Mining Journal*. A large proportion of our copper product is now refined electrolytically, and late improvements have, as shown by the paper on another page, not only improved the quality of the product, but diminished the time required, so that the stocks of copper locked up in course of treatment are very much reduced. That copper of 100 per cent conductivity should be not exceptional, but an ordinary commercial product, shows good work on the part of our refiners. It is well known, moreover, that much of the refined copper exceeds the original "standard" in conductivity by one or two per cent.

A Large Boiler Plant.

The Babcock & Wilcox Company report sales for the first six months of 1898 as in excess of the first 10 months of 1897. A notable order which they are now filling is that for the Ninety-sixth street power station of the Metropolitan Street Railway Company, of New York. This order for 15,000 horse-power wrought steel type boilers is the largest stationary boiler order ever placed. Previous sales to the Metropolitan Street Railway Company amount to 7,500 horse-power. The sales to the electrical industries in 1898 to this date aggregate 37,511 horse-power.

An Underground Trolley Car as a Booster.

Blockades frequently occur on lower Broadway in the busy hours of the day from overloaded trucks and teams which delay the passage of the cable cars, observes the New York *Sun*. It is not uncommon in such instances to see the cable cars helping to push the stalled trucks from the track. When the new underground trolley began to run on Second and Fourth avenues with such success that it is proposed to adopt the same system on the Broadway line, the belief was expressed that this mode of propulsion would be useless in helping to clear blockades.

A truck heavily loaded with granite became wedged in the track of the new underground trolley road the other night on Centre street, near the Worth street crossing. For more than 10 minutes the tired horses tugged and strained to pull the load from the track, but the wheels of the truck would not budge. The trolley cars had come up until the line reached all the way to the terminus at the Bridge. Finally, an ingenious bystander suggested that the car be called to the assistance of the horses.

A plank was stretched from the car to the rear axle of the truck in such a way as to avoid the fender on the front of the car. The signal was given to go ahead, and the truck started forward with such a sudden jolt that one of the horses stumbled and would have been seriously injured if the car had not been quickly brought to a standstill. On the next trial the truck was easily pushed from the track and the traffic of the line resumed, thus furnishing a practical demonstration that the wire which furnishes the power for the trolley cars, even though it does not move, is able to exert as great a pressure as the moving cable.

Anomalies of British Telegraph Rates.

A London paper comments interestingly on the anomalies of the British Post Office in the matter of telegraph rates, and observes that the charges for certain words in telegrams are so conflicting as to be quite incomprehensible. While, for instance, "father-in-law" counts as two words, "mother-in-law" is passed as one. Similarly, "ironworks," in the mind of the Post Office, is one word, and "steelworks" is counted as two. "Upstairs" and "downstairs" are treated in the same inexplicable manner.

"Kentish Town," where there is a postal and telegraph office, is charged as two words, but "Woodford Green" is regarded as one word. "Charing Cross" is two words, but "Newcastle-on-Tyne" is only one. "Llanfair-Pwllgwyngyll," a village in Wales, enjoys the privilege of being counted as one word.

It might be thought that the idiosyncrasies of the telegraphic system would reasonably end with the tariff, but such is not the case. Last Good Friday a telegram was dispatched from Fleet street and reached its destination at South Hampstead in one hour and 35 minutes, or about the same time as it took to send a full account of the battle of Atbara to London from the seat of war. The distance in the former case is five miles, which can be traversed on foot in one hour and a quarter, and the telegram would apparently have arrived just as soon if it had been sent via Cairo and the Nile.

Jamaica, Long Island, in Darkness.

Kerosene lamps and candles are in demand among the residents of Jamaica, Long Island. The refusal of Comptroller Coler to pay the bills of the Jamaica Electric Light Company has resulted in the village being left in darkness. The company operates under a contract made prior to the Greater New York consolidation, and claims that there is due from the city $22,000 for lighting Jamaica streets. The legality of the contract has been disputed, and the company has become tired of supplying light without pay.

"The Street Railway Red Book" for 1898 is issued and contains many statistics of value to the street railway man. The work includes a comparison of gross receipts for 1896 and 1897, which will undoubtedly provoke much general interest. Statistics and balance sheets are presented in tabular form so that comparisons for the past four or five years may be instantly made. The maps contained in this valuable work are especially commendable.

President McKinley has nominated to the Senate as members of the commission to revise and amend the United States patent laws Messrs. Francis Forbes, of New York; Arthur P. Greeley, of New Hampshire, and Peter S. Grosscup, of Illinois.

Air-Blast Transformers.

To dissipate the heat generated in the cores and coils of transformers of large capacity offers considerably greater difficulty to the designing engineer than is the case with small transformers, in which any design, consistent with reasonable efficiency, gives sufficient external surface to allow heat generated to radiate and so prevent undue rise in the temperature. With large transformers, however, the heat generated in the interior has less opportunity to radiate, and to dissipate it effectively, without sacrifice of proportion or efficiency, requires most careful design.

No true estimate of the safe capacity of a large transformer can be made unless the exposed surface of the transformer and the method of cooling are known. The current and magnetic densities may be moderate, the weight ample and the efficiency high, and yet the facilities for dissipating the heat be so poor that the transformer will operate at full load for a short time only, and then become so heated as to destroy the insulation. To avoid this result, therefore, it becomes necessary, even in transformers of moderate capacity, if no artificial cooling is to be employed, to depart from the most compact form and most economical proportions, and to sacrifice material and space to obtain sufficient external surface to radiate the heat. Much of the heat inside the case of a transformer is due to the fact that the air spaces between the transformer proper and the case do not conduct away the heat with sufficient rapidity. Filling these spaces with oil, while it increases the capacity of the self-cooling type of transformers and reduces the cost of the smaller sizes, not only carries off the heat much more readily than air, but in the small transformers has many other advantages, recently explained at length in the treatise on the "Use and Abuse of Transformers," published by the General Electric Company.

To construct large transformers, say, of 100-kilowatt capacity or larger, placing dependence for low temperature entirely on external radiating surface, necessitates too great a departure from economical proportions, and various designs have, therefore, been adopted in which provision is made for the circulation of a cooling medium through the interior of the transformer. If ducts passing entirely through the body of the winding are provided they must be comparatively narrow, or the size and cost of the transformer will be excessive and the efficiency low; the space wasted is too great. With narrow ducts oil is not a reliable cooling medium. Its circulation under the best conditions is sluggish, while the ducts tend to close gradually under two causes—the swelling of the insulating wrapping on the coils and the collection in the ducts of a deposit derived from the slow solution of the various liquid insulations employed when winding the coils.

To overcome these drawbacks, a new design was introduced in which the height of the laminated core is small compared with the external dimensions of the punchings. A large proportion of the copper is external to the core, and the exposed ends are so spread apart as to give wide openings between the coils for the access of the oil. This design insures a low temperature in the exposed part, and even a moderate average temperature (measured by increase in resistance), but the central portion often becomes dangerously hot without giving any direct evidence of the fact, and it is no less serious to have a high temperature in any part of the transformer than to have the entire winding at an unsafe temperature.

In large transformers the use of oil is undesirable, for reasons other than its poor efficiency, as a cooling medium. Small transformers are usually installed out of doors, and contain so small a quantity of oil that danger from fire is almost impossible. Large transformers, on the other hand, form, ordinarily, part of extensive plants, many units being banked together within a single building. Were oil used in these, the chances of fire would be greatly increased by the presence of the large quantities of inflammable material contained in the cases. Moreover, it is almost impossible to make large transformer cases oil-tight. In large transformers, therefore, satisfactory results are not obtainable if dependence is to be placed exclusively either on external surface heat radiation or on oil as a cooling medium.

FIG. 1.—AIR-BLAST TRANSFORMER.

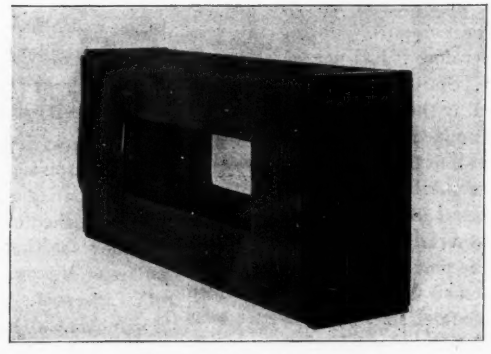


FIG. 3.—ASSEMBLED COILS.

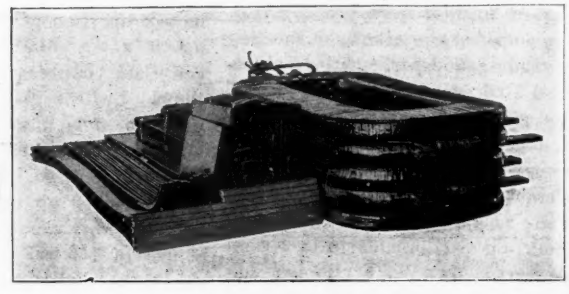


FIG. 2.—COILS AND DIAPHRAGMS.

The General Electric Company introduced and adopted the system of air cooling for its large transformers. In air-cooled transformers currents of air pass constantly through numerous narrow ducts and come into direct contact with the heated surfaces, absorbing their heat. Low temperatures are secured without sacrifice of efficiency or increase of cost, and the insulation, being constantly in contact with the current of air, needs no additional protection to guard against deterioration

Two methods are employed as standard practice by the General Electric Company in the construction of its large transformers. In the air-blast type the current of cool air is forced upward through the core and windings. In the natural draft type the coils and iron are so proportioned and placed that large surfaces are exposed, and the temperature kept within safe limits by the natural circulation of the air.

The air-blast type is designed for continuous operation, large output and high potential. In this type the windings are subdivided into numerous independent coils, each separately and heavily insulated. With such subdivision the voltage generated in a single section is low, even in transformers wound for a voltage of 15,000 to 20,000 volts, and the numerous air ducts between all the coils which this subdivision allows, in addition to the spaces in the iron lamination of the core, limit the rise in temperature to a few degrees only above that of the active cooling air current. The coils are wound with flat copper conductors, cemented together by an insulating compound before the exterior insulation is applied. The method of winding and insulating produces a strong coil, which will successfully resist any tendency of the conductors to vibrate. The use of rigid coils is important in large transformers, since the magnetic force tending to move the conductor is great, and vibration abrading the insulation might consequently be set up. The primary and secondary coils are assembled in small intermixed groups, with air spaces between the coils; and between every adjacent primary and secondary section are solid insulating diaphragms, which completely incase the primary winding, except at either end of the core, necessarily left open to allow the air

to circulate freely. At the end, however, the diaphragms project far beyond the coils, so that a surface insulation of great extent is provided between the primary and secondary. An additional insulation casing is placed around the entire structure of assembled primary and secondary coils, and separates the whole winding from the iron punchings assembled within and around them.

The insulation in the primary coils will withstand an insulation test at the potential of operation. Another equally heavy insulation is on the secondary coil. The diaphragm between the primary and secondary coils will also withstand the primary potential. Entirely neglecting therefore the additional insulation due to the double air duct between the primary and secondary winding, the method of insulation employed assures a factor of safety of at least three. The insulation test between the high-potential windings and the core is made at a voltage equal to twice the rated potential. A similar test is also given the insulation between the primary and secondary windings.

The cooling current of air is obtained from a motor-driven blower, and is forced from below through separate paths at right angles to each other, vertically through the windings and horizontally through the core. The admission of air is controlled by shutters at the top and at the side of the transformer. The power for the blower seldom exceeds one-quarter of one per cent of the total capacity of the transformer, and in most cases is much less, frequently not more than one-tenth of one per cent. It is considerably less than that which would be required to pump oil through an oil-cooled transformer of the same capacity.

Air-blast transformers are used on 15,000 volts potential or under, and are constructed for higher potential when necessary. Owing to the attention given to the electrical design the quality of the material used and careful workmanship, the efficiency under full load and partial load, determined under commercial operation conditions, is extremely high. The regulation on both inductive and non-inductive loads, similarly determined, is remarkably close—an important essential when incandescent lamps and motors are operated from the same transformer. Calculating the temperature of the interior of the air-blast transformer by the rise in resistance of its windings, the rise in temperature is guaranteed not to exceed 40 degrees centigrade above that of the surrounding air. Over 100,000 horse-power in these air-blast transformers has been installed, and no record yet exists of a burn-out due to heating or overload.

In the natural draft transformers, the dissipation of the heat is obtained by a natural circulation of the air around the coils. The essential parts of this transformer resemble those of the standard type H transformer. The core is formed of two upright legs on which the coils are wound. These are joined together by two yokes which complete the magnetic circuit. The transformer proper is surrounded by a corrugated iron case and rests on a substantial base of cast-iron. The cool air enters from below, and in passing through the transformer absorbs the heat and ascends, finding easy egress through the hood at the top.

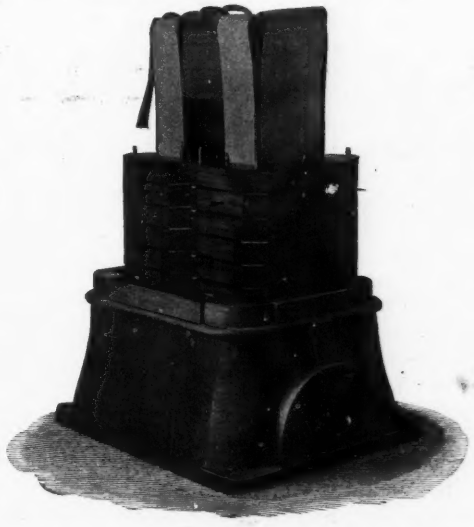


FIG. 4.—AIR-BLAST TRANSFORMER IN PROCESS OF CONSTRUCTION.

Natural draft transformers of large capacity are much more expensive than similar sizes of the air-blast type with air-blast outfit, but for moderate capacities the costs per kilowatt of the two types are more nearly identical. The capacity required, together with the particular conditions of the installation, determine when the two types can be furnished at an equal cost, and in such cases the natural draft type is preferable on account of its greater simplicity. Natural draft transformers are built in sizes ranging from five kilowatts to 200 kilowatts. They require no attention, no blower outfit, and may be located in any convenient place. The standard pressures for which these transformers are wound are 10,000 volts primary and 3,120 volts or under secondary. Transformers of higher primary voltage are built to fulfill special requirements.

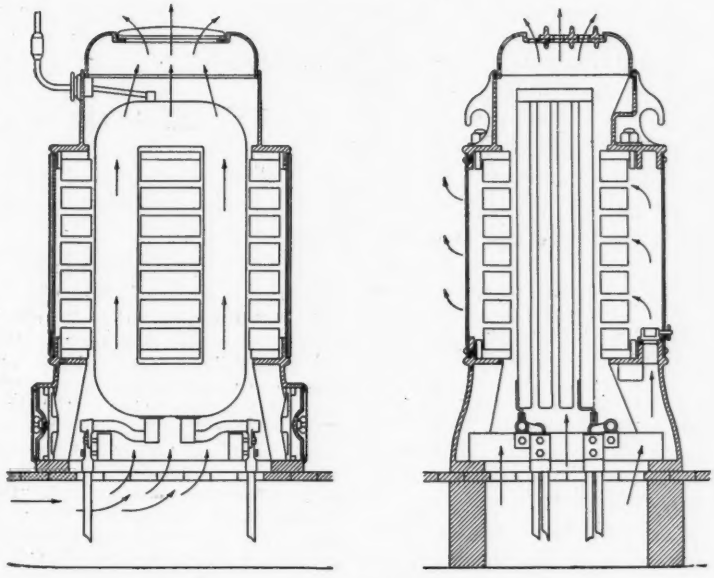


FIG. 5.—AIR CIRCULATING IN AIR-BLAST TRANSFORMER.

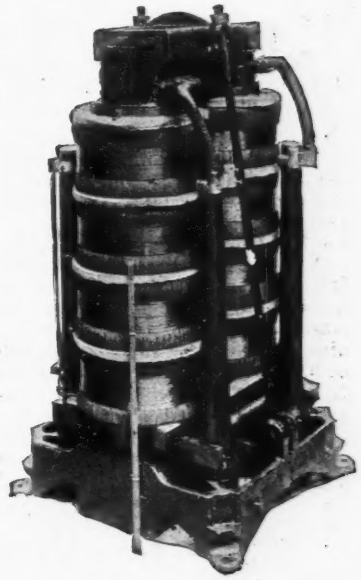


FIG. 6.—NATURAL DRAFT TRANSFORMER.

A Handy Data Sheet.

Mr. Georg Kirkegaard, of New York city, has prepared a handy machinists' and draughtsmen's data sheet, combining in an unusually compact form a great deal of valuable information of an everyday sort. The tables are designed to save time in machine shops, and are intended to go directly into the hands of workmen at the bench. The sheet is of a convenient size to tack up in front of the bench or on the inside of a tool-chest. Mr. Kirkegaard is a practical man and has observed the need of such tables. Those selected have been compiled with great care in order to bring into the smallest space the information most and oftenest required by the mechanic. A number of the more important tables are original with Mr. Kirkegaard. These valuable sheets are printed on heavy paper at 15 cents each and on cardboard at 25 cents each, postage prepaid. They may be obtained from the Electrical Review Publishing Company, Times Building, New York city.

TELEPHONE NEWS AND COMMENT.

The capital stock of the Detroit, Mich., Switchboard and Telephone Construction Company has been increased from $100,000 to $250,000.

At a recent meeting of stockholders of the Franklin Telephone and Telegraph Company, held at their office in Farmington, Me., it was voted to increase the capital stock of the company to $25,000. It was formerly $5,000.

At a meeting of the Exeter, N. H., Telephone Company the following officers were elected: George B. Shaw, president; Fred Eno, vice-president, and Leonard D. Hunt, secretary and treasurer. The following board of directors was also elected: George B. Shaw, Fred Eno, Leonard D. Hunt, John Kimball and George J. Hayes.

At Battle Creek, Mich., thieves have adopted a unique mode of stealing. The other morning the new long-distance telephone company could get no communication west of that city, and a line repairer was sent out on a bicycle and discovered that thieves had cut one mile of double copper wire and hauled it away. The weight is 400 pounds, and the thieves will realize about $24 for it for old copper.

Regarding the proposed increase of capital stock of the New England Telephone and Telegraph Company, president Thomas Sherwin says:

"A meeting of the stockholders of the company will be held in July to consider a proposition to increase the authorized capital stock from $12,000,000 to $15,000,000.

"No plan has yet been considered for issuing any part of the new stock in the immediate future. The increase has been recommended by the directors in anticipation of the needs of the company for funds which will be required from year to year for extension of the property and business, and with a view of taking up, with funds to be realized from the sale of new stock, the six per cent bonds of the company which will mature within the next three years at the rate of about $500,000 a year.

"The issue of capital stock is now $11,400,000."

The New England Telephone and Telegraph Company operates a system of exchanges and toll lines extending over Maine, New Hampshire, Vermont and the larger part of Massachusetts. Its exchange and private line subscribers now number 46,000 and the system of toll lines consists of 28,000 miles of wire.

Two Immense Electric Cranes.

The Brown Hoisting and Conveying Machine Company, of Cleveland, Ohio, with New York offices in Havemeyer Building, have just closed a contract with the Wm. Cramp & Sons' Ship and Engine Building Company, Philadelphia, Pa., for two large cantilever ship-building cranes, complete with steel runways for same.

These cranes are of the well known cantilever type, the patent of Mr. Alex. E. Brown, and are similar to those installed several years ago by the same company in the yard of the Newport News Shipbuilding and Dry Dock Company, and elsewhere.

The Cramp cranes will be driven by electricity, and each crane will be mounted on a steel trestle 60 feet high and 600 feet long, running between two battle-ships in course of construction, so that each crane in operation will serve two ships. These cranes are each about 200 feet long from end to end, and 85 feet from the ground to the under side of cantilever arm. One of them will lift 15 tons at 60 feet from the center, and five tons on the extreme end of cantilever. The other crane is of slightly smaller capacity.

Either one will be capable of a speed of 700 feet per minute on the trestle, and similar high speeds for hoisting and trolley travel. The trestles and cranes are entirely of steel, and are among the largest electric cranes ever built.

The first crane is to be in operation by the middle of November.

OUR CANADIAN LETTER.

CHICOUTIMI, QUE.—Mr. Picher, it is reported, has had plans prepared for an electric railway to be built here.

LA PATRIE, QUE.—There is talk here of constructing an electric railway between this place and Scotstown.

ST. CATHARINES, ONT.—A by-law authorizing the construction of an electric railway between this city and Port Dalhousie has received its first reading in council.

WATERLOO, ONT.—The rate-payers have sanctioned the by-law granting a bonus of $12,000 to the Galt & Preston Electric Railway for the extension of its road.

HAMILTON, ONT.—The promoters of the Hamilton, Chedoke & Ancateo Electric Railway state that the line will be constructed to Hamilton if the council buys the Beckett Mountain drive.

LONDON, ONT.—The scheme for an electric railway from London to Stratford, Arcona and Thedford, connecting the Canadian Pacific Railway and the Grand Trunk Railway, is making satisfactory progress.

QUEBEC, QUE.—The Quebec, Montmorency & Charlevoix Railway Company converted the road between this place and Cap Tourmente into an electric line, and a branch line to Montmorency Falls is to be operated by electricity.

TORONTO, ONT. — The Toronto Street Railway Company have had plans prepared for several extensions to their system, including a second line down Station street. This line will be built as soon as the bridge across the Yonge street track is built by the city. This bridge is estimated to cost $200,000.

MONTREAL, QUE. — The railway committee of the Privy Council at Ottawa considered the bills for electric railways in the neighborhood of Montreal. A charter was granted to the North Shore Electric Railway Company, which proposes to build a railway from Three Rivers along the northern shore of the St. Lawrence. The Montreal & Southern Counties Railway Company was given power to extend its operations to the counties of Beauharnois, Chateauguay, Huntingdon and Napierville. The promoter of both undertakings is Mr. A. J. Corriveau. J. A. C.

Montreal, July 8.

Magnetism and the Spectrum.

In a communication to the London *Engineer*, Mr. F. Charles, of Bristol, England, makes the following observation:

At a time when so much attention is being paid to X rays and new developments of the theory of light, it will not be inappropriate to direct attention to a passage in the "British Cyclopædia," published in 1835. The passage in the article on "Spectrum" runs as follows: "One of the most extraordinary effects which has resulted from the action of colored rays is the communication of magnetic powers to metallic bars. Dr. Morichini, of Rome, was the first person who discovered the properties which he considered were confined to the violet rays. At that season of the year when the light of the sun is most powerful, he admitted it into his chambers, and having formed a colored spectrum by means of a prism, he collected the violet rays in the focus of a convex lens, and by moving the lens parallel to a steel needle he made the focus of the violet rays pass from the middle of one extremity of the needle to the other, and always in the same direction, without touching the other half. By continuing this operation for nearly an hour the needle was found to be completely magnetized. The same result was obtained by Dr. Carpi at Rome and Mr. Cosimo Redolfi at Florence. When the violet light was passed through the thick smoke of burning sugar the needle showed only a very slight degree of Magnetism." Further on it is explicitly stated that in 1817, when Dr. Playfair was in Rome, he saw the same experiment carried out with perfect success.

Annual Meeting of the Penn Electric Company.

The annual meeting of the Penn Electric Company, of Philadelphia, was held recently in Camden, N. J. About 586,000 shares of stock were voted and there was little opposition to the re-election of the old board of directors, composed of A. J. DeCamp, Henry Clay, Samuel B. Huey, James McManus, W. L. Elkins, Martin Maloney, George S. Graham, David H. Lane and James E. Hays. Mr. DeCamp was elected president, and F. A. Crowell, secretary. The receipts for the year from rental of the company's conduits was $4,250, and the balance on hand is $726.54. It was reported that the deficiency now amounts to $19,123.42, having been reduced $8,592.51 during the past year.

LITERARY.

The issue of the "American Electrical Directory and Buyers' Manual" for the second quarter of 1898 has been issued. It contains a complete list of central lighting stations and considerable valuable matter relating to them. The price of this publication is $4 per year, and subscriptions may be placed through the Electrical Review Publishing Company, Times Building, New York.

A Unique Watch Chain.

Among the souvenirs of the recent electrical conventions was one of a watch chain, made in Vienna, of peculiarly jointed gun-metal. It was very popular and much sought for. Mr. Geo. J. Jackson, of the National Conduit and Cable Company, was the donor, and the friends of his company who have a watch now have a handsome chain also.

The Salem, N. J., Electric Light, Power and Heat Company's plant was sold by Sheriff Westcott a few days ago for $5,000. It was bought in by Thomas Sinnickson, Jr.

Street Railway Receipts in 1896 and 1897.

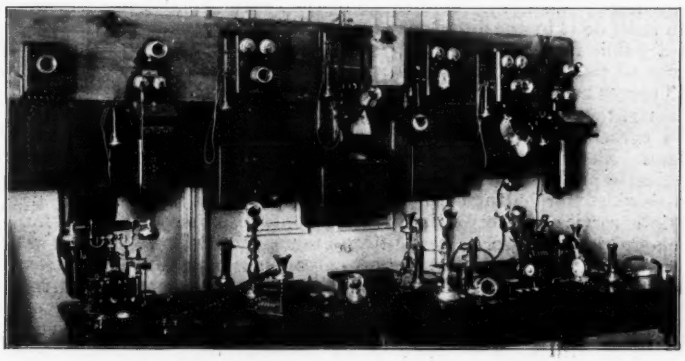
The *Street Railway Journal's* financial supplement, "American Street Railway Investments," contains in the 1898 edition, just published, an interesting comparison of the gross receipts for 1896 and 1897 of the principal American street railway properties, 175 in number. It appears that there are no less than 26 properties earning $1,000,000 or more; 19 earning from $500,000 to $1,000,000; 46 earning from $100,000 to $500,000; while the figures for 84 properties earning less than $100,000 are included in the comparisons. In the first group, including the principal street railway properties of the country, the gross receipts for 1897 were 2.2 per cent greater than the receipts for 1896; in the second group the receipts decreased 0.11 per cent; in the third group, comprising the 46 properties earning from $100,000 to $500,000, the receipts increased as a whole 1.87 per cent; and with the smaller systems there was but a slight variation in the receipts for the two years. The entire 175 properties, which are presented in tabular form in the "Red Book," show an increase in receipts of 1.9 per cent in 1897 as compared with 1896.

These increases are all much smaller than those shown in 1896 over 1895. In these two years the difference in gross receipts was 7.4 per cent of the 1895 figures. Although these comparisons are for a portion only of the street railways of the country, they seem to indicate that the latter have just about held their own in 1897, but have done little more than this and have not kept up the rate of increase promised by last year's reports.

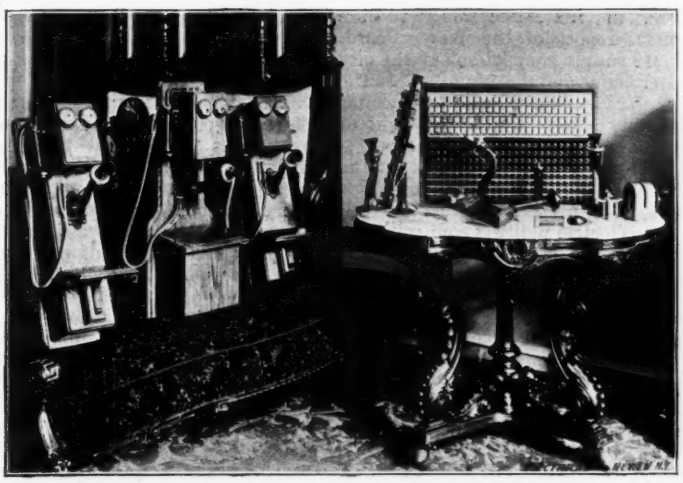
This supplement to the *Street Railway Journal* contains a mass of interesting and valuable statistics relating to street railways, together with 24 fine maps of the more important properties. The operating statistics and balance sheets are presented in tabular form, so that the returns for four or five years past can be inspected without the necessity of referring to previous editions of the book. We believe that this is the only publication of this character in which balance sheets from year to year are directly compared, and yet it is undoubtedly true that the financial condition of properties is never completely understood unless the closest inspection of balance sheets be made, for padding or concealment of earnings is usually brought to light only in the balance sheets.

The Victor Telephone Exhibit at the Chicago Convention.

The exhibit of the Victor Telephone Manufacturing Company at the recent Independent Telephone Convention held at Chicago attracted more than passing attention owing to the elegance of the quarters secured and especially on account of the completeness of the exhibit, considering the very short time the company has been in existence. Located in parlors D and E, one of the best corners on the floor, few delegates or visitors were allowed to pass the rooms without a cordial invitation from Manager Blaine or Superintendent Yoxley to inspect the several pieces of apparatus shown. The exhibit, although compact, embraced a sample of nearly everything that enters into the construction or maintenance of either a central exchange, line, or subscribers' station. Switchboards, transmitters, receivers, wall sets and minor accessories, such as cable and cross-connecting boards, lightning arresters, magnetos and ringers, could be freely examined and gave all interested a good idea of the high quality of the goods the Victor company is placing on the market.



THE ERICSSON TELEPHONE COMPANY'S EXHIBIT AT THE CHICAGO CONVENTION.



THE VICTOR TELEPHONE MANUFACTURING COMPANY'S EXHIBIT AT THE CHICAGO CONVENTION.

Ericsson Telephone Company's Exhibit at the Chicago Convention.

The Ericsson Telephone Company, of New York, through its energetic Chicago representative, Mr. Landon P. Smith, succeeded in impressing all delegates and visitors to the recent telephone convention at Chicago with the fact that in one instance at least a foreign concern has practically succeeded in furnishing telephone apparatus that meets in many respects the requirements and ideas of the American telephone public. A very complete line of Ericsson apparatus had been placed on exhibition in parlor 250, the illustration herewith giving a good idea of the variety of instruments made. With the exception of exchange apparatus, such as switchboards and lightning arresters, the line embraced nearly everything necessary for the equipment of a short or long-distance line, the make-up and finish of many devices showing clearly the desire on the part of the manufacturer to cater to American tastes.

American Institute of Electrical Engineers.

At the meeting of the executive committee June 24, Mr. C. O. Mailloux, of New York, was elected a vice-president of the Institute to fill the vacancy caused by the previous election of Dr. A. E. Kennelly to the presidency. Mr. Robert N. Baylis was also appointed a member of the board of examiners, succeeding the late Dr. Chas. E. Emery. The following associate members were elected: Walter Cummings Allen, inspector of electric lighting, government of District of Columbia, District Building, Washington, D. C.; Albert H. Armstrong, electrical engineer, General Electric Company, Schenectady, N. Y.; Geo. A. Damon, with B. J. Arnold, electrical engineer, 1541 Marquette Building, Chicago, Ill.; Frank H. Dexter, student Cornell University, residence, 51 Huestis street, Ithaca, N. Y.; P. M. Downing, superintendent electrical department, Blue Lakes Water Company, Blue Lakes City, via Jackson, Cal.; Joseph Lyons, patent solicitor, with Gustav Bissing, 908 G street, Washington, D. C.

The following associate members were transferred to membership:

Alfred A. Thresher, electrical engineer and proprietor, Thresher Electric Company, Dayton, Ohio; William B. Jackson, New York & Staten Island Electric Company, West New Brighton, N. Y.; Paul M. Lincoln, electrical superintendent Cataract Construction Company, Niagara Falls, N. Y.; Thorburn Reid, consulting electrical engineer, 120 Liberty street, New York city; Philip Green Gossler, electrical engineer, Royal Electric Company, Montreal, P. Q.; Theodore E. Theberath, Pacific coast engineer, Stanley Electric Company, San Francisco, Cal.; Frederick M. Pedersen, assistant electrical engineer, Crocker-Wheeler Electric Company, New York city; Will K. Dunlap, electrical engineer Westinghouse Electric and Manufacturing Company, Niagara Falls, N. Y.

Brooklyn Lighting Companies to Consolidate.

The ELECTRICAL REVIEW can state on excellent authority that within a short time a consolidation will have been effected by which the Kings County Electric Light and Power Company, of Brooklyn, N. Y., will acquire the Edison Electric Illuminating Company of Brooklyn. Stocks of both of these companies have experienced a rapid rise within the past few days on the strength of the rumor that the consolidation outlined above would occur. The nature of the deal, it is understood, will take the form of a long-time lease of the Edison company by the Kings County company. It is in effect practically a purchase, and also includes the Municipal Electric Light Company recently purchased by the Edison interests.

PUBLIC LIGHTING IN RELATION TO PUBLIC OWNERSHIP AND OPERATION.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, CHICAGO, JUNE 8, 1898, BY ALEX. DOW.

(Concluded from page 9.)

Some effort was made by the companies in the legislature of the state and in the city council to protect their interests, but these bodies, especially in a reform year, can not be expected to go counter to a strong public sentiment. In this they are wise in their generation.

Would the public of Detroit, after the agitation for municipal ownership had become general, have approved of award of a contract at a low price, or would it have insisted on municipal ownership as a matter of principle?

An answer to this is merely an expression of opinion, but I believe that had a low price been offered the agitation for municipal ownership would have been suspended, and that the companies might have secured terms more to their interest than was the action actually taken. There were many people in Detroit who did not wish to see the experiment of municipal ownership tried, except as a last resort. There were a few people who believed in municipal ownership as a matter of principle. There were doubtless also a few who expected to reap a personal benefit from the establishment of the city plant Nevertheless the great majority of the citizens sought only to reduce the expense and to improve the quality of the public lighting, and cared nothing for city ownership, except as a means of reaching a desired end.

In other lake cities where the agitation was fully as strong, concessions on the part of the lighting company led to a continuation of the contract system. The case of Toronto is a notable one, because the municipal sentiment is exceptionally well developed there. The local company is now performing lighting for the city at a figure a trifle less than was estimated as the cost of operation of a city plant. At Cleveland the local company holds the business because it made a price so near to actual cost that there could be no possible saving in municipal ownership, and the price was accepted after a careful inquiry into costs in neighboring cities on behalf of the municipality. The recent case of Tonawanda is another instance of success won on the same lines. There the local company submitted figures made by a recognized authority, showing the actual costs of operation in several representative municipal plants, and followed these figures by a bid more favorable to the city than municipal operation. I am assured that in each of these cities, while the contract figures are low, the management of the local company considers the business ultimately, if not directly, profitable.

In these instances the local companies have retained their public lighting business by demonstrating that it was to the interest of the municipality to let them retain it. In this they have put into successful practice the most important part of the policy which I advocate. I submit that the only sufficient reason why a municipality should contract with a private company for public lighting is that the private company can do the work, and is willing to do it, cheaper than the municipality can itself do it by the direct operation of a public lighting plant. It is in order to show how this comes about.

There is no longer any question of the right of a municipality to own and operate its own public lighting plant. Electric street lighting is a distinctly public service, which must be provided for by the municipality. It is a service to every citizen; is a sequence of the social conditions which constitute city life as distinguished from rural life, and can only be effectively performed on municipal account and under municipal control. Herein it differs from the electric lighting of private premises, and it is necessary to note the difference. Electric lighting is the cheapest as well as the best light for streets and public places. For private premises, on the contrary, electric light is not a cheap light under usual conditions. It is not now, and is not likely to become, an illuminant of universal use, to the exclusion of gas and oil. Why this is necessarily so is well known to the members of the association. To the general public it is a statement better proven by a couple of good examples than by a long statement of causes. In the city of Detroit there were, in 1897, according to the annual report of the Water Board, 52,219 supply connections to the city water mains and the "families" in the city were 54,945. Each "family" was certainly a user of artificial light of some kind. Illuminating gas of 18-candle-power quality is sold in the city of Detroit at $1 per 1,000 cubic feet. The maximum price charged by the electric lighting companies for incandescent lighting is 14.4 per kilowatt-hour, including renewals of incandescent lamps; the minimum is four cents, and the system of charging makes the average price 10.8 cents per kilowatt-hour, which, allowing for difference in candle-power, is equivalent to gas at $1.21½ per 1,000 cubic feet on the average, or to gas at $1.62 to the customer whose individual load factor obliges him to pay the maximum price. These are comparatively low prices, both for gas and electricity. Under these circumstances there are in the city of Detroit approximately 18,000 (?) customers for illuminating gas, and 4,000 customers for incandescent electric light. What light do the remaining three-fifths of the possible customers use? It is safe to say that they use kerosene oil. It is also safe to say that there are very few cases where oil is used merely because gas or electricity is not available. The main cause of the use of oil is its lower cost. I need not say to this audience, although I have found it necessary to make the statement to other audiences which were entitled to be considered intelligent, that there is not the least likelihood of the production costs of kerosene oil, of gas and of electric light materially changing their ratios to one another. As to their selling prices, I think that the Standard Oil Company is better satisfied with the profit which it makes on the sale of kerosene in Detroit than are either the Detroit Gas Company or the electric light companies in that city with their profits.

I submit, however, a second example of the relative cheapness of gas and electricity, from which example the question of profit is eliminated. The city of Glasgow, Scotland, owns and operates its gas-works and owns and operates its electric lighting plant. Neither of them is intended to make a profit. I have in my possession signed communications from the managers of each department in which it is written that the price of gas is two shillings and two pence per thousand cubic feet, and that the price of electricity for incandescent lighting (not including renewals of incandescent lamps) is six pence per kilowatt hour for the first hour's use of the demand, according to a Wright meter, and two and one-half pence per kilowatt-hour thereafter. Making the same corrections as in the Detroit calculation and assuming that the incandescent lamps paid for as "extras" in Glasgow, are as efficient as those furnished free by the Edison Illuminating Company of Detroit, the Glasgow price for gas is fifty-two cents per thousand, and the Glasgow price for incandescent lighting is equivalent to gas at $1.35 at the maximum rate, and fifty-six and one-quarter cents at the minimum rate. The average is about the same as the Detroit average. I think this example from a city where municipal ownership has been most thoroughly exploited, and where the municipal management is above suspicion of inefficiency or corruption, proves beyond question that electric lighting for private use is a luxury, and as such must continue to be used only by those who can afford luxuries; that is to say, by a minority of the citizens of any municipality; not by a majority, much less by every citizen.

Therefore, while it is admitted that the lighting of the streets is truly a public service, which may be performed by the municipality for and on behalf of every citizen, the furnishing of electric light to private consumers is not a public service, but is essentially a service to a few individuals, and as such should not be undertaken by a municipality whose object is to perform only those duties which municipal society as a whole owes to itself as a whole. This principle should be clearly understood, and should be boldly maintained. It is necessary that a municipality shall undertake certain services, and it is possible that it may undertake others, but the propriety of its undertaking any service depends on whether that service is to the public or to individuals; to the many or only to the favored few.

This leaves to private enterprise the supply of electric light to private consumers. In performing this service there will be built and equipped a power-house; there will be organized an operating and a managing force; there will be constructed lines of distribution. All of these may be, and part of them certainly will be, adapted to the performance of public lighting, in addition to the service of private consumers. To whatever extent this double adaptability exists in the private plant, there will be duplication of equipment in any other plant separately established for performance of the public work. Moreover it is peculiarly characteristic of public lighting operated all night that its addition to the ordinary work of a private lighting plant tends to reduce the average cost of the combined output. In these considerations rests the possibility of a contractor profitably performing public lighting for a city at or below the price at which the city can itself do the work, and yet it being to the interest of the contractor to undertake the business.

Let us for a minute assume that municipal engineering and management and municipal financiering can be just as good as private engineering and private financiering. If they are not so, it is the fault of the municipality, because technical and financial skill and executive ability are for sale in the labor market and are purchasable by a municipality, even as they are by private employers. There remains only one evident cause which should tend to make the cost of a municipal plant differ from that owned by an individual or a company. That difference is that the individual proposes to make a profit and the municipality does not. Looking closer at the facts we find that the municipality must in most cases allow the equivalent to a profit, because a municipal plant is built by money borrowed at interest. In the case where the money is not borrowed, but raised by direct assessment, the municipality has prevented some of its citizens from profitably using the money taken from them by taxation to be invested in the lighting plant, so that even in the exceptional case the possible profit to the taxpayer on the money withdrawn from his business has to be considered. But the rate of interest on municipal bonds is usually less than the rate of profit which a private owner is willing to accept on money invested in the electric lighting business. It is four per cent as against six or seven or eight per cent. In the final analysis the difference between the cost of lighting by contract and that of lighting at cost by a municipally-owned plant should not exceed four per cent on the capital invested in the plant. I assume in making this statement that the rate of interest on city bonds is a fair measure of the profit that investors expect on a secure investment. If the investment in an electric lighting plant were equally secure, the rate of interest necessary would be no greater.

The security depends so largely on the policy of the municipal authorities that it may approximate to that of municipal bonds on the one hand; or, on the other, it may be of the same order as the stock of a speculative gold mine or a Klondike expedition. In saying that the difference should not exceed four per cent, I am to be understood as implying such conditions as take the investment out of the speculative class. I am also to be understood as implying that proper salaries for management have already been paid out of earnings, and that the profit mentioned is that payable to capital alone; in other words, an exact parallel to the payment of interest on a municipal bond.

It follows that if the organization and equipment of an existing plant engaged in the supply of electric light to private consumers is available for the purpose of performing public lighting, this maximum difference of four per cent can be thereby reduced or even reversed. In every case the difference should be reversible. There are causes to be considered later which tend to the contrary, but the fact remains that there is no irremovable cause why an existing electric lighting plant should not be able to perform public lighting at a less price than the municipality can do the work itself.

Of the causes which tend to the contrary, one is that the plant which has a contract for public lighting may have very little private service, or none at all. Some other plant in the same city may do all or most of the private business. This condition of affairs can be only temporary. The consolidation of the two plants is an economic necessity, certain to arrive in time. The only condition justifying the existence of two plants in the same city is that the city is so large as to make a division of territory desirable; and even in that case an operating agreement is to be preferred to complete independence.

The public has been told that consolidation of plants is not to the public interest. This is an error, and the way to prove it such is to give to the public the surplus profits of consolidation in the shape of lower rates and better service—either or both.

Another cause tending to handicap the contractor is that few municipalities will make contract for a long term of service. Even the advocates of municipal ownership who are willing to issue 20 or 30-year electric light bonds, and who will not write off more than three or four per cent for depreciation of plant in making their estimates of city operation, will protest against a contract running more than a year or two. They claim for the municipal plant all the advantage of a secure investment, and simultaneously deny these advantages to the contractor. We know that the securing of a long-term contract permits the installation of the most economically operated machinery, and reduces the percentages of profit, which must be earned annually. The objection to the long contract, that it denies to the city any share in the profits of possible improvements effected during the term of the contract, can be met by so drawing the contract that the margin of profit shall plainly be reasonable to begin with, and that the city may share in the results of improvements in consideration of guaranteeing a similar reasonable profit on the investment to be made in such improvements. A 10 or 20-year contract with such a clause could be safely taken at a very low price.

A possible solution of this problem is city ownership of the plant, combined with operation by a contractor. I think that this plan may by and by become common. It involves too many details to permit of my discussing it at present.

The very worst handicap that a contractor may have to carry is excessive capitalization. Here it must be noted that many municipally owned lighting plants do not report all their capital expenditure, so that in carelessly made comparisons of fixed charges the contractor appears to have overstated his investment in order to increase the apparent cost of operation. Any comparison must be on an identical basis for capital as well as for operating charges. And for the purpose of adjusting prices between municipality and contractor, only one basis for capital charge is acceptable; namely, the present value of the plant in brief, a properly made inventory. This proposition is so radical that I state the reasons for it.

The possible bases for a capital charge are as follows: First—The face value of the securities issued by the plant. That this is an impossible base of adjustment is too well known to all electric light men. Second—The current market value of these securities. This is impracticable, because many securities are not on the market, and because the immediate earning capacity of a plant affects the price of its securities, and because—last, but not least—some securities are speculative rather than industrial. Third—The actual cost of the plant. This would be proper if all plants had been built at the same time and if no plant had been obliged to be rebuilt. As it is, the construction cost of two plants built, the one in 1888 and the other in 1898, the two of identical capacity and of similar type, may be to one another as two to one; the earlier plant may have cost twice what was paid for the later, solely because of the reductions in the prices of machinery and material of construction in the last ten years.

The only remaining possible base for a capital charge is the present value of the plant; and I do not think that any other can be made acceptable for the specific purpose of adjusting a price for public lighting. It does not follow that the capital account is to be readjusted to a corresponding figure. It is only requisite that the company accept as a proper profit on public lighting business an allowance based on inventory value of the investment. It would be well for the industry, however, if all our capitalizations were brought near to present values. And one good result of revaluation would be a logical sequence—the depreciation of the investment from year to year would necessarily be admitted as a proper charge against revenue. If a profit is only to be allowed on capital sufficient to construct a plant at the comparatively low construction prices now ruling, any further decline in cost of construction must be considered an impairment of capital, to be made good before any profit can be paid. It is not to be understood that I expect an electric lighting company to stop dividends or to reduce capital stock in order to make good in any one year an extraordinary depreciation charge, due, for instance, to the replacement in the year of old type machinery with new, in order to meet a public demand for a higher grade of service. Such extraordinary charges must be financed according to well understood rules. The loss of value of the old machinery does not occur in an instant, but is a process continuing through several years. So far as it is possible, this loss of value should be anticipated by charges made in advance—in other words, by the accumulation of a renewal fund. But where this has not been done the charges should be distributed over a proper period with due regard to all interests involved—in other words, so as to secure the greatest good for the greatest number. The principle is all important. The detail as to how a proper depreciation charge shall be put on the books is a matter to be disposed of in the most convenient manner.

Having recited my premises, I now state my proposed policy as a recommendation, as follows:

I recommend that the association declare by resolution:

1. That a municipality may properly provide for public lighting either by the ownership and operation of an electric lighting plant, by the operation of a contractor under lease of a municipally owned plant, or by contract with the owner of a private plant.

2. That the supply of electric light to private users is not properly a municipal function.

3. That the performance of public lighting under contract by a private plant in connection with the supply of electric light to private users is essentially the method of least expense.

4. That the existence of two electric lighting plants in the same territory is an economic error tending to increase the cost of production, and thereby the selling price; and that the maintenance of competition is to the detriment of the public.

5. That public lighting by contract should be performed at the lowest price consistent with a reasonable profit on the value of the investment; that no electric lighting contractor should demand more than such a profit, and that each municipality should protect the contractor in the enjoyment of his profit, and against impairment of his investment, in order that a minimum profit may become reasonable.

6. That in order to adjust prices in the absence of competition it is necessary that costs be ascertained and prices approved by a competent authority, acceptable to the public as well as to the contractor.

7. That in the absence of a constituted authority competent to ascertain costs and prescribe prices, members having public lighting contracts under consideration should endeavor to have the adjustment of the contract price undertaken by a temporary commission, or arbitration committee, who will adopt as the basis of adjustment the principles set forth in these resolutions, particularly in resolution number 5.

8. That there is no essential difference in the organization of municipally owned plants requiring a different analysis of costs from that which is proper for private enterprises, and that the publication of the costs of municipal lighting plants properly analyzed is beneficial to the electric lighting industry. Further, that the similar publication of the costs of private plants is desirable, but is at present impossible because of its advantages to actual or possible competitors.

In conclusion, I desire to say that the tendency of public opinion appears to be toward some interference by and on behalf of the public with corporations performing so-called public services. Such a tendency is a concomitant of our social progress. It is not merely a temporary surge, but is a part of a general movement. It can not be withstood, but may be guided into proper channels. The general result of any such movement is for good; the damage which is done to individual rights is incidental and is more often the result of needless opposition by the individual. In this matter of public lighting the right of the community to interfere is so evident that it has been one of the first subjects considered, and will be one of the first disposed of; and its priority in time will establish its disposition as a precedent for the future disposition of similar questions. There is immediate need for clear thinking and for well considered speech and action—for speech telling the public that electric light companies desire to do business according to the golden rule, and for action plainly in conformity with the speech. I believe that this association can appropriately speak for its membership, and that its members are willing to live up to the principles which the association may enunciate.

The contest at Des Moines, Iowa, between the Mutual and Iowa telephone companies ended the other day, when the City Council passed a resolution ordering the Iowa Telephone Company to quit business in Des Moines, and, if it fails to obey the order, directing the legal department of the city to begin action to oust its poles, wires and plant from the streets.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

DEER ISLE, ME.—The telephone company is extending the line to Oceanville and Moose Island.

YORK CITY, PA.—The Hanover Telephone Company will extend its line to Smith's Station, Sinsheim, Green Ridge and Grahamville.

EXETER, N. H.—The Exeter Telephone Company, with a capital of $2,000, has been incorporated.

CANTON, S. DAK.—A local telephone exchange has just been completed here by a co-operative company, composed of citizens of the city.

DELAND, VA.—The new telephone line from this place to Upperville has been completed.

KEYSTONE, W. VA.—The Bluefield Telephone Company is pushing work vigorously on the line which will connect the entire Flat Top coal field, Keystone and Welch with Bluefield. The west end switchboard will be at Elk Ridge, where an office is being built. This is a local enterprise of much magnitude, and doubtless will in a short time extend the system from Welch to Oceana and Madison, giving direct communication with the capital city.

JACKSONVILLE, TEX.—The Southwestern Telephone Company has reached this point and is connected with the East Texas Telephone Company.

SPRING VALLEY, MINN. — The Northwestern Telephone Exchange Company has begun constructing a line from here to La Crosse. This will give a long-distance service to Wykopf, Preston, Lanesboro, Rushford, Caledonia and numerous smaller towns along the Southern Minnesota railway.

OKLAHOMA CITY, MO. — Oklahoma Telephone Company has been incorporated; capital stock, $100,000; incorporators, Harry C. Barter and George R. Gordon, Browington, Mo.; W. E. Moore and McGregor Douglass, Oklahoma City.

KEESEVILLE, N. Y.—A long-distance telephone line between this place and Saratoga is in process of construction and the poles are now being set. The line will run via this place, Jay, Keene and Elizabethtown. P. O'Neil, of Franklin Falls, is furnishing the poles.

IRVINE, KY.—J. M. Thomas and T. C. Vaughn are building a telephone line from Vaughn's livery stable, in Irvine, to the R. N. I. & B. depot, and from there to Estill Springs, thus connecting the three most important points in town.

SARDIS, MISS.—The Cumberland Telephone and Telegraph Company has been granted permission for the construction of telephone system.

HANOVER, PA. — The Hanover Telephone Company has decided to extend its lines to Smith's Station, Sinsheim, Green Ridge and Glenville, York County.

PITTSTOWN, PA.—The Keystone Telephone Company will do business in this place.

Electric Light and Power.

SOUTH BROOKVILLE, PA. — The Solar Electric Light Company is extending its lines to this place.

HONOEYE FALLS, N. Y. — The Lima-Honoeye Electric Light Company, of this place, has been incorporated; capital, $125,000; directors, H. H. Sitell, R. L. Fryer, J. C. Conway, P. P. Miller, H. W. Box, A. L. Williams, A. M. Holdin, H. C. Gilbert and Clarence McGregor, of Buffalo.

NEWARK, N. J.—Articles of incorporation of the North Jersey Light and Power Company have been filed in the County Clerk's office. The incorporators are William T. Francisco, Albert C. Williams and Harry M. Warren, all of Montclair. The authorized capital stock is $15,000.

DURHAM, N. C.—The Mayor may give information concerning establishment of electric light plant, for which bonds will be issued.

KANSAS CITY, MO.—C. S. Sweetland and R. J. Ingraham have been granted permission to construct and operate an electric plant to furnish light, heat and power to consumers.

MIAMI, FLA.—An electric light plant will probably be established.

WYNNE, ARK.—George W. Eldridge may be addressed concerning electric light plant.

RICHWOOD, OHIO—M. W. Hill, Mayor, may be addressed concerning electric lighting.

SEA ISLAND, N. J.—City Clerk may be addressed concerning electric lighting.

BUNKER HILL, ILL.—An electric light plant will be established, for which about $7,000 worth of bonds will be issued.

BATESVILLE, ARK.—Robert Neill, President Board of Improvements, may give information concerning establishment of proposed electric light plant.

PARIS, TEX.—Paris Light and Power Company has been incorporated by T. J. Record, J. A Porter, D. H. Scott, J. D. Crook and B. J. Baldwin, for the manufacture and sale of gas and electricity for light, power and heat, and for all other purposes for which said gas and electricity may be used; capital stock, $60,000.

FITZGERALD, GA.—C. C. Goodnow, Mayor, may give information concerning electric light plant.

TRENTON, ILL.—An electric light plant is being erected here.

ALBANY, N. Y.—Port Chester Electric Lighting Company has been incorporated, to operate in the towns of Westchester County; capital, $50,000; directors, William L. Ward and Addison Johnson, of Port Chester, and William E. Ward, of Rye.

New Electric Railways.

ST. LOUIS, MO.—The East St. Louis Belt Railway Company, with the main office at East St. Louis, has filed its certificate of incorporation in the County Recorder's office at Edwardsville. The incorporators are Julius S. Walsh and E. P. Bryan, of St. Louis; J. M. Hamill and F. C. Daab, of Belleville, and James Hanna, of Alton. The capital stock is $500,000.

CLEVELAND, OHIO—The Cleveland & Eastern Railway Company has been incorporated, and work has already been started on a new suburban road running from this city east through Cuyahoga, Geauga and Ashtabula counties to the state line of Pennsylvania. A private right of way has been secured through the larger part of Cuyahoga and Geauga counties as far as Burton. It is possible that the line will be completed as far as Shardon this Fall. H. P. McIntosh has been elected president of the new line; H. A. Sherwin, vice-president, and E. G. Tillotson, secretary and treasurer. The board of directors are H. P. McIntosh, H. A. Sherwin, R. A. Harman, H. Clark Ford, W. H. Lamprecht, Howard White, W. G. Gates and E. G. Tillotson.

SYRACUSE, N. Y.—The Syracuse, Skaneateles & Moravia Railroad Company has petitioned the trustees of the village of Solvay to allow the railroad company to construct an electric railroad through Solvay.

WAUKEGAN, ILL.—The Chicago & Milwaukee Electric Railway is rapidly completing its line between this city and Highland Park, and expects to have cars running between these two points soon.

NEENAH, WIS.—City Clerk may be addressed concerning proposed construction of electric railway.

BRAZIL, IND.—Dr. J. D. Sourwine, of this place, has applied to the board of commissioners of Clay County for a franchise for an electric line from that place to the Vigo County line.

New Incorporations.

NEW YORK, N. Y.—The Standard Electro-Vapor Motor Company has been incorporated; capital, $50,000; directors, S. W. Warner, B. L. Warner and W. M. Warner, of Yonkers.

DES MOINES, IOWA—The Ottumwa Electric and Steam Company, of which Samuel Mahon, Calvin Manning, J. W. Garner, J. B. Sax, William Doggett and J. H. Merrill are the incorporators, has filed articles with the Secretary of State. Its capital is $200,000.

GILLESPIE, ILL.—The Gross Electric Experimental Company has been incorporated; capital, $12,500; incorporators, William M. Gross, John Heilers, William W. Williams.

CHICAGO, ILL.—The Mutual Electric Company has been incorporated; capital stock, $25,000; incorporators, E. H. Cheney, F. S. Richmond and H. C. Hall.

EPHRATA, PA.—A charter has been granted to the Ephrata Electric Company, whose capital stock is $15,000; incorporators, F. E. Bailey, Philadelphia; A. W. Mentzer, H. G. Mentzer, Ephrata; S. N. Bailey, Dillsburg, Pa.; John W. Von Neida, Ephrata.

A New Use for the Roentgen Rays.

In a note recently communicated to the Paris Académie des Sciences, M. H. Couriot suggests a novel use for the X rays, says London *Engineering*. Professor Roentgen's discovery has already proved of great service in surgery, but Mr. Couriot suggests that the rays may prove as efficient in showing the intimate structure or siliceous skeleton of our coals as they are in defining the calcareous skeletons of animals. He states that, by means of a powerful Crookes tube and a fluorescent screen, it is easy to determine the purity of a fuel. Carbon in all its forms is exceedingly transparent to the rays, while silica and silicates are opaque, and on placing a lump of coal between the tube and the screen all the intimate details of the slag and clinker forming portions of the fuel at once appear. Mr. Couriot has tested in this way anthracite coal, lignite, peat, coke and block fuel. The finest particles of silicate, though quite invisible to the eye, show up at once on the screen as dark spots or bands upon a bright ground. The differences in the quality of a series of coals can be traced step by step, showing at once the variations in the purity of the fuel. The conglomerate structure of block fuel is clearly exhibited, while with coke the particles of iron sulphide are indicated by black spots on the fluorescent image. Carbon is so transparent that it is unnecessary that the samples should be regular blocks, as rough lumps, the sides of which usually follow the natural planes of cleavage of the coal, serve perfectly well. Mr. Couriot has taken radiographs with specimens one and one-eighth inches to two inches thick, the coil used having a spark 10 inches long, and the exposure being five minutes.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 28, 1898.

606,560 Regulation of rotary transformer, direct current, electro-motive force; B. G. Lamme, Pittsburgh, Pa.—Consists of a stationary transformer having means for varying the electro-motive force supplied by its secondary, of a rotary transformer receiving current from said transformer secondary one or more choke-coils, means for connecting the same in said secondary circuit and means for varying the field-magnet excitation of the rotary transformer, whereby a wide variation of potential at the direct-current terminals may be secured.

606,589 System of electrical distribution; C. F. Scott, Pittsburgh, Pa.

606,605 Electric motor; J. G. Truman, Lemon City, Fla.—Consists of a movable armature, a series of connecting bars or plates attached thereto and electro-magnets with which the plates are also connected.

606,630 Alternating-current motor meet; J. A. Illinreg Nuremberg, Germany.

ISSUED JULY 5, 1898.

606,646 Rheostat; H. B. Cutter, Philadelphia, Pa.—A rheostat, an automatic magnetic circuit-breaker, adjustable with respect to the above or below normal flow of current necessary for its action, and means of preventing the closing of the circuit-breaker when the rheostat arm is in certain positions.

606,658 Machine for punching telegraphic paper; G. M. Gibson, Chulmleigh, England.

606,663 Electric railway; J. C. Henry, Denver, Colo.—The method of changing the two motors of a car equipment from series to parallel relation which consists in short-circuiting the field magnet of one of said motors, subsequently short circuiting the armature of said motor, breaking the series connection and closing a connection placing said armatures in parallel, and breaking the short-circuit through its field magnet.

606,664 Electric railway; J. C. Henry, Denver, Colo.

606,746 Electric light switch; F. L. Temple, St. John, Canada.

606,761 Method of, and apparatus for, generating alternating currents; M. Hutin, Paris, France—The method of generating alternating electric currents by causing electrical alternations of the desired frequency, and re-enforcing the same to the desired volume

606,762 Alternating-current dynamo; M. Hutin, Paris, France.

606,764 Telephone exchange; F. A. Lundquist, Chicago, Ill.—A circuit-closing device, a crank, a pitman connected thereto, a mercury receptacle into which said pitman is thrust by said crank, means for causing said crank to stop at a fixed position, and connections for permitting said crank to be rotated by hand.

606,769 Electric heater or rheostat; R. Van Rensslaer, New York, N. Y.—An electric heater or rheostat consisting of an outer shell and a resistance filling therein in the form of a spiral layer of comminuted material with the convolutions in contact.

606,771 Fuse box; J. B. Smith, Manchester, N. H.

606,792 Electric radiator; F. W. Quidas, Mount Washington, Md.—Consists of a resistance, a casing surrounding the same, a block of poor heat-conducting material enclosing the back of the casing and in contact with it, and having a portion of said material extending along the edges of the front to hold said casing in the block.

606,799 Electric meter; W. Stanley, Pittsfield, Mass.

606,803 Telephone system; B. R. Dodge, Post Mill Village, Vt.

606,819 Contact device for electrically-propelled vehicles; H. P. Davis, Pittsburgh, Pa.—A contact device for engagement with overhead electric conductors, comprising a roller, a supporting head or frame therefor, formed of two sheet-metal strips of different shape rigidly fastened together and provided with suitable bearings for the roller, laterally-extending guard and brace rods and curved, tapering sheet-metal plates forming continuations of the contact surface of the roller.

606,825 Contact device for electric railways; C. A. Terry, New York, N. Y.

606,826 Current-collecting apparatus for electric railways; C. A. Terry, New York, N. Y.

606,827 Overhead construction for electric railways; C. A. Terry, New York, N. Y.

606,828 Traveling contact device for electric railways; G. Westinghouse, Pittsburgh, Pa.

606,830 Insulator; Ben Willard, Schenectady, N. Y.

606,852 Telephonic transmitter; T. F. Ahern, Detroit, Mich.—Consists of two substantially triangular carbon electrodes placed in frictional contact, the area of which is varied by the sound vibrations of the diaphragm carrying one of the electrodes.

606,863 Alternating current dynamo; L. Gutmann, Peoria, Ill.

606,877 Speed limit for engines; J. R. Reynolds, Hartford, Ct.

606,884 Electric snap switch; A. F. Wood, Philadelphia, Pa.

608,887 Electric extraction of poisons; J. R. Campbell, Cincinnati, Ohio—Consists in providing the negative electrode of an electric battery with interchangeable receivers of animal, vegetable or mineral substance, to extract a poison from the body of a nature or kind corresponding with or the negative electrode employed.

606,912 Means for preventing disturbances in telephonic circuits; O. T. Blathy, Budapest, Austria-Hungary.

606,917 Electric brake; H. P. Davis, Pittsburgh, Pa.—A plurality of electric motors arranged in paralled in a local circuit to be driven as generators, with a plurality of brake magnets, one in each branch of such circuit.

606,939 Switch for arc lamps; C. A. Pfluger, Chicago, Ill.

606,954 Lightning arrester; W. E. Athern, Brooklyn, N. Y.

606,990, 606,991 Electric railway; J. C. Henry, Denver, Colo. Consists of two motors having their armatures and field magnets in separate circuits, a controller for controlling the operation of such motors, and a supplementary switch and connections arranged to connect said field magnets in series or in parallel.

606,993 Device for obtaining stereoscopic effects in exhibiting pictures; C. F. Jenkins, Washington, D. C.

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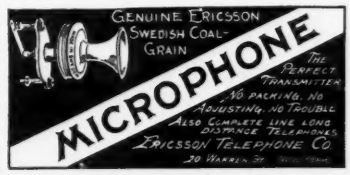

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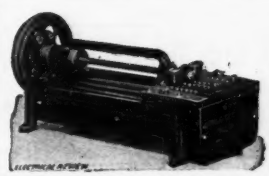
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Kindred.... ...Interests

The Western Electric Company, Chicago, carries a complete stock of interior conduit, iron armored, brass armored and plain. Parties wishing to purchase material of this kind can feel confident that their orders will be promptly and satisfactorily filled.

The Central Manufacturing Company, of Chattanooga, Tenn., is mailing to its many friends and customers a large business postal card giving illustrations and prices of its extensive line of cross-arms, pins and brackets. This company also makes wood thimbles for steel pins, duplex and special pins, and all kinds of electrical molding. Special sizes of cross-arms are made to order. This price list is accompanied by a system of code words which will undoubtedly prove of value to the customer in avoiding errors when ordering by telegraph.

A New Belt Dressing—There has been a growing demand among belt users for a more convenient form of belt dressing than the paste. The Joseph Dixon Crucible Company, Jersey City, N. J., is now placing on the market a solid belt dressing in round bars, about eight inches long and two inches diameter. It makes a package convenient to the hand and easy to apply, even to fast-running belts. The company does not claim that the solid dressing is as good a preservative of the life and elasticity of the leather as the Dixon paste, but it is quick to apply and quick to act, and that is what is wanted by the general run of belt users.

The Mica Insulator Company, of New York and Chicago, report a gratifying demand for their "micanite" segments for electric light and power generators. Some heavy orders are being executed at the factory in Schenectady, N. Y. The heavy increase of the company's business during the last few months is largely due to improved processes of manufacturing. They offer to send free to any machinery builder or electrical repair concern a set for any one of the smaller machines free of expense. Parties interested in the economical insulation of electrical machinery will do well to write the company at their office, either in New York or Chicago.

The Walker Company, of Cleveland, Ohio, has secured a contract from the Union Carbide Company, of Chicago, which is said to be the largest order for electric machinery of the alternating type ever placed at one time. The order consists of twenty 500-horse-power alternating-current generators, single phase, 60 cycles, to deliver a current of 2,500 amperes at 200 volts. Besides these there will be five 10-horse-power direct-current generators as exciters, and a complete switchboard for all of these machines. The spot selected for this mammoth plant, which is to be run entirely by water-power, is at the falls of the Soo at Sault Ste. Marie, where calcium carbide will be produced on a large scale.

The Ericsson Telephone Company, 20 Warren street, New York, are the importers of the standard telephones bearing that name made in Sweden. Within a very few years these Swedish instruments have gained a strong hold in this country, and during the past month the New York company has enlarged its facilities for meeting the demands of the American market. The apparatus includes a complete series of instruments for all adaptations, and special domestic sets for long-distance work. It would be well for all purchasers of telephones, receivers, transmitters, magnetos or any telephone parts to write for a copy of the '98 catalogue, which will be sent on application. In addition to the New York office, the company is represented by the following distributing agents: Electrical Engineering Company, Minneapolis, Minn.; Plummer, Ham & Richardson, Worcester, Mass.; National Automatic Fire-Alarm Company, New Orleans, La.; F. Bissell & Company, Toledo, Ohio; E. B. Seeley & Company, Philadelphia, Pa.

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